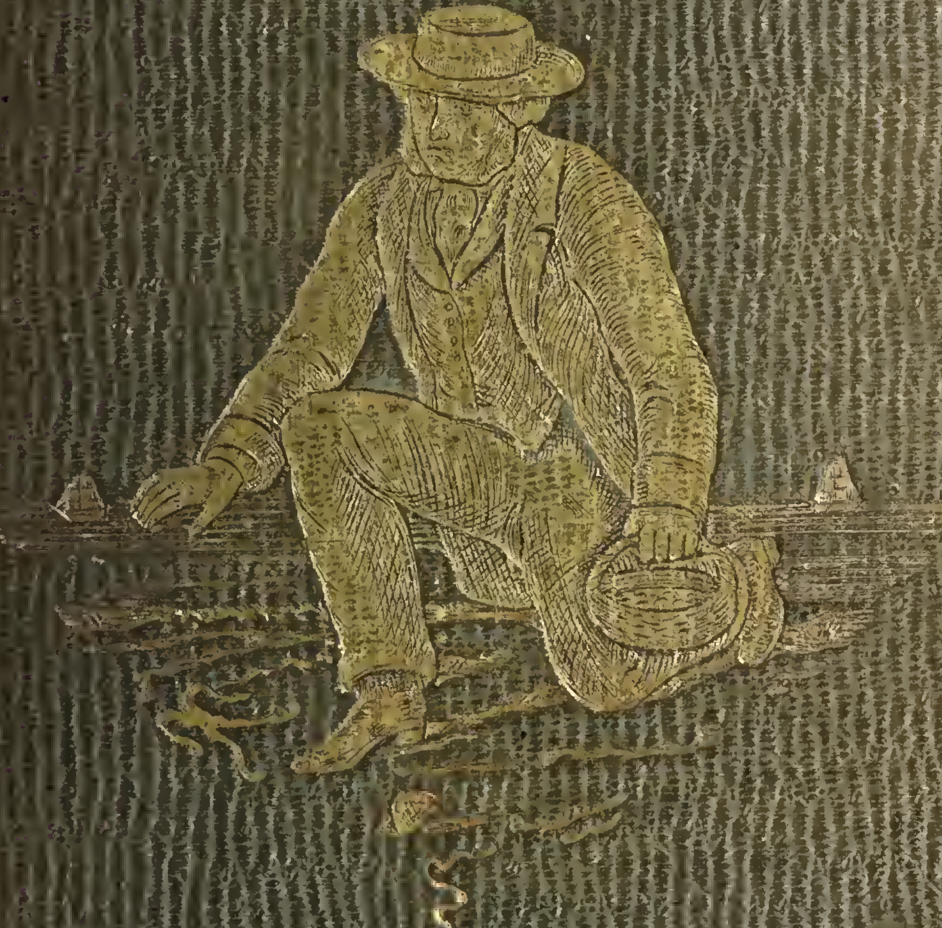

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116

PICKINGS ON THE SEA-SHORE.

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PICKINGS ON THE SEA-SHORE;

OR,

CLIFFS, SANDS, PLANTS, AND ANIMALS:

A HAND-BOOK FOR BRIGHTON, RAMSGATE, FOLKESTONE, DOVER, HASTINGS, THE ISLE OF WIGHT, SCARBOROUGH, AND OTHER PARTS OF THE COAST;

AND FOR

THE VIVARIUM AT HOME.

BY THE REV. CHARLES WILLIAMS,

AUTHOR OF

"SILVER-SHELL, OR THE ADVENTURES OF AN OYSTER," "GEORGE MOGRIDGE, HIS LIFE, CHARACTER, AND WRITINGS," &c., &c.

"There is no picking up a pebble, without finding all Nature in connexion with it."

LONDON:
JUDD AND GLASS, GRAY'S INN ROAD,
AND 21 PATERNOSTER ROW.

1857.

CONTENTS.

CHAPTER I.

Page
FACILITIES FOR VISITING THE COAST—WHITHER SHALL WE GO?—THE COAST OF KENT—THE DOWNS—MARGATE—RAMSGATE—BROADSTAIRS—THE GOODWIN SANDS—DOVER—FOLKESTONE—THE SUSSEX DOWNS—HASTINGS—BRIGHTON—THE DEVIL'S DYKE—THE COAST OF HAMPSHIRE—THE ISLE OF WIGHT—THE COAST OF DORSET—WEYMOUTH—THE ISLE OF PORTLAND—THE COAST OF YORKSHIRE—BRIDLINGTON—FILEY—SCARBOROUGH—THE COAST OF NORTH AND SOUTH DEVON—WHAT SHALL WE TAKE WITH US? 2—18

CHAPTER II.

THE UNRUFFLED SEA—THE SEA INSPIRITING—IMMENSITY OF THE OCEAN—ONLY ONE SEA—THE TIDES—AN INCIDENT—THE RISING TIDE—SALTNESS OF THE SEA—EVAPORATION——TEMPERATURE OF THE SEA—COLOURS OF THE SEA—CAUSE OF WAVES—A SUMMER'S NOON—CLOUDS—A STORMY DAY—THE STORM—THE WRECK—THE LAW OF STORMS—BACKHUYSEN, THE PAINTER—THE GREAT RESERVOIR—A WORLD WITH NO SEA - - - - - - - - - - - - - - 19—45

CHAPTER III.

MARGATE SANDS—RAMSGATE SANDS—SEA-BATHING—ULVERSTON SANDS—SCARBOROUGH SANDS—SAND-RIPPLES—GRASSES—SAND REEDS—FLOWERS—THE SEA BEET—THE SAMPHIRE—THE CHESIL BANK—HOW ARE PEBBLES FORMED?—AMBER—JET—CORNELIAN—STORY OF A PEBBLE - - 46—78

CHAPTER IV.

Page

ROCKS, STRATIFIED AND UNSTRATIFIED—THE UNDER-CLIFF—CHALK CLIFFS OF KENT—ALUM BAY—ENGLAND ONCE PHYSICALLY UNITED WITH FRANCE—ENCROACHMENT OF THE SEA ON THE LAND—HOB-HOLE, NEAR WHITBY—CAVE AT FLAMBOROUGH HEAD—ARCHED ROCK AT FRESHWATER—THE NEEDLES—PILLARS ON THE YORKSHIRE AND DEVON COAST—CAVES IN DEVON—QUARRIES OF THE ISLE OF PORTLAND—RAVAGES OF THE SEA - - - - - - - - - - 79—101

CHAPTER V.

SEA-WEEDS—THEIR VARIOUS KINDS—THEIR USES—CORALLINES—THEIR REMARKABLE STRUCTURE—THEIR POLYPS—SEA ANEMONES—BEAUTIFUL SPECTACLE—THE CORAL-GROVE—RED CORAL—CORAL REEFS AND ISLANDS - - - 102—129

CHAPTER VI.

DREDGING—THE SPONGE—THE JELLY-FISH—PHOSPHORESCENCE—THE BEROE—ASCIDIANS—ONE-SHELLED CREATURES—BIVALVES—STRUCTURE AND COLOURS OF SHELLS—MARINE WORMS—THE SEA-STAR—THE SEA-URCHIN - - - 130—153

CHAPTER VII.

THE SHRIMP—THE PRAWN—THE CHANGE OF ITS SKIN—THE LOBSTER—THE COMMON SHORE CRAB—THE PEA CRAB—THE VELVET CRAB—THE HERMIT OR SOLDIER CRAB - 154—162

CHAPTER VIII.

EGGS OF FISHES—THE HERRING—THE MACKEREL—THE GULLS—GREBES—THE GUILLEMOT—THE PUFFIN—THE CORMORANT—LARGE MASSES OF ROCK ONCE LIVED - - 163—174

CHAPTER IX.

HOW TO CONSTRUCT A VIVARIUM—THE PLANTS AND CREATURES TO BE PUT IN IT—DIRECTIONS FOR ITS CARE 174—178

PREFACE.

It will gratify the writer to know that some one, of wearied powers, has peeped into this volume, and shouted, like the soldiers of Xenophon, "*The sea! the sea!*" determined on visiting it for the invigoration of bodily and mental health. But, as this book can easily be carried in a lady's bag, or a gentleman's pocket, he hopes it will be borne hither and thither on the coast, to answer the questions often rising to the lip, as something previously unknown, or disregarded, catches the eye, "*What is this?*"

It is evident from the sitters on many a bench, turned-up boat, shingly beach, and crag, that books are an essential at the sea-side. Would it not, however, furnish a fresh and pure enjoyment, if, instead of a new or old novel being the *only* one, the habit were formed in early life, of carefully observing the various objects around, and of submitting them to after inquiry and research?

"Nature," it has been truly said, "is not loquacious, although filled with inexhaustible stores; she presents enough at first sight to attract the thoughtful, but mankind must interrogate and study her, in order to come at all, perhaps to a thousandth part of that which she has to communicate." To such studies the present volume can only prove a humble pioneer; but they may be pursued with every possible advantage, as with what is gathered, under its guidance, from the sea-shore, there is at least an occasional reference to the ample details of such noble works as those of Dr. W. Harvey on Sea-weeds; Dr. Johnstone on Zoophytes; Professors Owen, Rymer Jones, and Grant, on the Animal Kingdom; and the beautiful and Christian volumes of Dr. Landsborough and Mr. Gosse, minutely and most intelligently recording the results of personal observation.

PICKINGS ON THE SEA-SHORE.

CHAPTER I.

GOING TO THE SEA-SIDE.

I'll go to the sea—I'll go the sea;
For oft have its breezes brought vigour to me;
I'll bathe in its waters, lit up by the ray
That brightens and warms in the sun at mid-day.

A vigorous row, or a well-guided sail,
New pleasures will waft me, the mind to regale;
While the cliffs are surveyed as exalted they stand,
To be gaily climbed up on returning to land.

As I traverse the sands and the pebbly shore,
I'll pick up what passed oft unheeded before;
For I find that a sea-weed, a plant, or a shell,
Has many a story of wonder to tell.

Yet listen!—for here I must candidly own,
That pleasures are little when quaffed all alone;
Who would be a hermit when off to the sea,
Where joys are so many? so come! come! with me.

Hurrah! for the cliffs, and the beach, and the sand,
With scenes of the changing, the lovely, the grand;
And while we gaze on them, some pickings we'll find
For the dear kith and kin who *must* stay behind.

FACILITIES FOR VISITING THE COAST—WHITHER SHALL WE GO?—THE COAST OF KENT—THE DOWNS—MARGATE—RAMSGATE—BROADSTAIRS—THE GOODWIN SANDS—DOVER—FOLKESTONE—THE SUSSEX DOWNS—HASTINGS—BRIGHTON—THE DEVIL'S DYKE—THE COAST OF HAMPSHIRE—THE ISLE OF WIGHT—THE COAST OF DORSET—WEYMOUTH—THE ISLE OF PORTLAND—THE COAST OF YORKSHIRE — BRIDLINGTON — FILEY — SCARBOROUGH—THE COAST OF NORTH AND SOUTH DEVON—WHAT SHALL WE TAKE WITH US?

Going to the sea-side was once a very different thing to what it is now. Only think of Wolcot, *alias* Peter Pindar, standing on Wool Quay, near the sheds of Billingsgate, waving his hand, and saying in his usual vein of satire, to the *only* vessel bound for a long and dreary voyage to the coast of Kent:—

> "Go, beauteous hoy! in safety every inch."

Not the slightest improvement was made in the "Margate hoy" for many a long year; as is evident from a friend of the writer's sending home the following account of his voyage:—"We set off from Billingsgate on *Tuesday* afternoon about two o'clock, the wind fair but calm, and the weather fine. At eight o'clock we anchored in the Thames till two o'clock in the morning, when we sailed again; the wind, however, changed, and became directly contrary, while the waves were very high. After sailing during the day, with a rough sea, tacking continually, and having one side of the vessel close to the water, we found, about seven in the evening, though with Margate fully in view, that we could not land for want of a high tide. We then anchored in Margate roads. Soon after, a storm began: the thunder rolled; such vivid lightning I never saw; and it was only after being on board *thirty-eight* hours, during the whole of which I was upon deck, that we were able to get on shore. So much for *recreation!*"

In later times, it was usual to dine on the road to Brighton, generally at Reigate; and if the traveller proposed to go "as far as" Hastings, Portsmouth, or Southampton, two, perhaps three more meals, would be found essential to comfort during the journey. Even when "Nimrod," a *nom de plume* of Captain Apperley, described the wonders performed by modern "coaching," he mentioned the "Vivid" as the fastest, which, starting from the Spread Eagle in Gracechurch Street, reached Brighton in *five hours and a quarter*.

Now-a-days, the steam-vessel says, as plainly as it can speak, "Only step on board, where you will find abundant provision for a voyage, varying little in the time it occupies, and, except you cross the channel—for the results of which no guarantee can be given—unlikely to cause you any inconvenience." And before every station, at many hours of the day and the night, stands the mammoth steam-horse, puffing instead of neighing, feeding on water instead of oats, and ready to bear you over land, and especially wherever the steam-boats ply, at a speed with which no race of Bucephalus could ever compete; commonly with very slight symptoms of discomfort or weariness.

The question is, therefore, *Whither* shall we go? To determine this, let us examine our line of coast, and consider the eligibilities of spots which are easily accessible. Now, then, for Kent, whose coast has much to interest. The Swale, an arm of the estuary of the Medway, cuts off from the mainland the Isle of Sheppey. East of the Swale, the marshes extending inland from the Thames terminate, and the coast rises to some height in clayey cliffs, which, with a slight interruption at Herne Bay, extend to Reculver and the flats which form the western limit of the Isle of Thanet. This island, containing about forty square miles, includes the well-known watering places Margate and Ramsgate. It is now separated from the mainland only by the narrow channels of the Stour, one of which runs through the marshes to the estuary of the Thames at Reculver, and the other enters the German Ocean at Pegwell Bay.

The Downs, about eight miles in length and six in width, afford a safe anchorage, and are the general rendezvous of shipping leaving the Thames for the channel, or returning homewards. Vessels in both circumstances may constantly be seen from the neighbouring coast. The Downs are sheltered on the west and north-west and partially on the north sides, by the Kentish coast, or by the sands connected with it. To the north are the Small Downs, a smaller roadstead immediately contiguous to the Downs properly so-called.

Margate stands high and stable on the white cliffs. It is seen from several miles distance; and, ere long, the pier is reached, crowded with persons waiting to welcome relatives or friends, or only for that favourite sea-side amusement, "seeing the boats come in;" and all kinds of aid are eagerly proffered by porters and cab-drivers, inn and lodging-house keepers, as you pass up the Jetty. Kingsgate, so called from Charles II. landing here in 1683, is situate on the north side of the Isle of Thanet. On a fine day the cliffs in the neighbourhood of Calais may be clearly seen from the high land around St. Peter's.

Ramsgate has one of the finest marine bulwarks in the world in its Pier, built of Purbeck and Portland stone, with pavements of fine granite. The east pier is nearly 3,000 feet in length, and the west pier, with its handsome lighthouse, is about half that length. The town, delightfully placed between the cliffs in a natural opening, rises from the sea-shore in a gradual ascent to the high lands in the rear. Many a pleasant walk may be enjoyed there; while here and there a resting-place appears, with an inscription which ought to be unnecessary:—

"Do not *cut* an old friend."

Proceeding towards the west cliff, and traversing its whole length, the old-fashioned village of St. Lawrence is speedily gained. A short walk in the opposite direction conducts to East Cliff Lodge, the summer villa of Sir Moses Montefiore. Continuing the walk on the edge of the cliff, Broadstairs, a quiet little watering-place of some antiquity, is reached; which the Duchess of Kent and the Princess Victoria frequently visited. About a mile from Ramsgate is a picturesque little village and Pegwell Bay. Beyond this, by the sea-shore, the scenery becomes bolder; and there is a very agreeable walk, partly by the coast and partly through the fields and lanes, to Minster, once the metropolis of the Isle of Thanet.

Opposite to the coast which extends from the Isle of Thanet to the South Foreland lie the Goodwin Sands. According to popular tradition, here was once an island, forming the estate of Goodwin, Earl of Kent, and destroyed by the sea in the year 1097; but it is considered, with some probability, to have been a shallow previously covered with a depth of water sufficient to admit the passage of vessels over it, but made bare about that period by the accumulation of sand. It has been imagined that should a ship of the largest size strike upon it, it would be entirely swallowed up by the quicksands, here so extraordinarily voracious; but accurate observation shows that they are of the same quality as the sand on the opposite shore. The Goodwin Sands are of irregular form, about ten or eleven miles long from north to south; their greatest breadth is three or four. They are divided into two parts by a narrow channel called "the Swatch," navigable by small boats. A morning sail is often made to the Goodwin Sands from Ramsgate—a pleasant trip when the yacht is good and trim, landing its passengers if so disposed, and bringing them back—all at a small charge—to dinner.

Dover takes its name Dwyr, from Dwfywa, "a steep place;" or, some say, from the little river Doer, or Dour, which runs through it, industriously working on its way mills for corn, oil, and paper. The Castle, with all its details and adjuncts, and especially its glorious sea-view, urges and amply recompenses an ascent of the lofty hill on which it stands. Immense harbour-works are still going on. Had they been raised in a past age, and had there been a harbour accessible at all times of the tide, many lives would have been saved. At Dover there is a long and noble promenade, from whence the coast of France is clearly visible.

Folkestone has its attractions. The Lees, or West Cliff, is a delightful walk, from which you may look over the brow of a sandstone cliff to the port, which, like Dover, has its fishing-boats, colliers, and steamers, particularly those to Boulogne, now reached within two hours. On the left, Copt Point juts into the sea, while far beyond it the chalk cliffs of Dover terminate in the one well known, bearing the name of Shakespeare. To the westward are Sandgate, Hythe, Romney, and Lydd, on the long flat streak of Romney Marsh: at the end of all is seen the light-house at Dungeness.

The principal feature in the surface of Sussex is caused by the high ridges of chalk hills generally known as the Downs. They rise from the marsh of Pevensey to the bold promontory of Beachey Head; they then tend westward as far as Shoreham—a tract properly denominated the South Downs. Their average height is about 500 feet above the level of the sea; but Ditchelling Beacon rises to the height of 585 feet; Firle Beacon 820 feet; Chanctonbury Ring 814 feet; Rooks Hill and Bow Hill each 702 feet; and Beachey Head 564 feet above that level. The Downs have a rich covering of a short and delicate turf. Their surface is gracefully undulating; the northern escarpment is precipitous; whilst the southern declining gently, and, westward of Brighton, gradually blends with the low land of the distant coast.

Hastings is pleasantly situated on the coast of Sussex, in a hollow, sheltered on every side except the south by lofty hills. A delightful scene is presented from these high cliffs and undulating downs. Inland, as far as the eye can reach, a beautiful and highly-cultivated country spreads out its hills and dales, its fields and woods. Seaward, the boundless deep rolls beneath, where barks of every kind, from the cockle-shell pleasure-boat to the stately Indiaman, pursue their devious course. The abundant radiation of heat from the light colour of the surface, and the dryness of the soil absorbing all humidity, and allowing but little evaporation, prevent those dense and cold land-fogs which are peculiar to all districts having a clayey subsoil. Like every other place situated on the coast, Hastings is occasionally enveloped in a sea-fog, which sometimes suddenly arises in the finest days of summer; yet these mists, however formed, occasion, it is said, no chill, and deposit no dew.

The first sight of Hastings Castle, for which a small toll is paid, suggests the notion of a marine tea-garden; but the massy walls in ruin, the relic of the old tower, and the remains of a chapel, with time-worn steps here and there, soon lead the thoughts to far distant times. Not far off is Hollington, with its church, which, as Charles Lamb says, "stands bare and single in the middle of a grove, with no house or appearance of habitation within a quarter of a mile, like a church found in a desert isle to startle Crusoe with a human image." The ruins of the old Abbey at Battle are also worth a visit; while Winchelsea will show how the waves can drive a town from its original site, and then abandon it altogether until it stands as a memorial of what it was.

Brighton stands near the centre of the curved line of coast of which the two points are Beachey Head and Selsea Bill. The town, built on a slope, is defended from the north winds by the high land of the South Downs, which from Beachey Head as far as the central part of Brighton, press closely on the sea, and form high chalk cliffs. The town has not increased towards the north so much as along the coast; but it has run up the depressions in the chalk, along which the London and Lewes roads were formed. The marine promenade at Brighton is truly a noble one; on it £150,000 were expended. It consists of a lofty and solid sea-wall, in many parts 60 feet high, supporting a terraced walk, with a wooden railing, where the pedestrian may stroll at pleasure, and the invalid be wheeled backwards and forwards in his Bath chair; while the equestrian will find contiguous a straight and ample road, where the occupants of various vehicles also gaily disport themselves.

One remarkable chasm in the lofty ranges of the Sussex Downs is called the Devil's Dyke. The legend connected with it is one of the traditions that exhibit the great enemy of man as outwitted. He was digging hard at night, it was said, to let in the sea to overwhelm the pious inhabitants of the weald of Sussex, when he fled alarmed to return no more to his work; scared by an old woman's lantern, which he took to be the rising sun! Adjoining the Dyke is a lofty hill of many miles in extent; the top of which is said to be the highest point of the entire area of the Sussex Downs. On the sides of this almost mountainous range the visitor will observe a number of sudden and declivitous hollows, produced by some extraordinary convulsion.

The coast of Hampshire is low towards the east side of the county, where there is a wide but not very deep bay or inlet, divided by Hayling Island and Portsea Island into three parts—Chichester Harbour on the east, Langston Harbour in the middle, and Portsmouth Harbour on the west; presenting, when the tide is up, broad sheets of water. Portsmouth Harbour especially, with its shipping, has, when viewed from the top of Portsdown, a striking appearance; but when the tide is out, little is seen except an assemblage of mud-banks, with channels of deeper water lying between them.

From the entrance of Portsmouth Harbour the coast runs north-west to the entrance of the estuary or inlet called Southampton water. From the entrance of this water a low coast runs south-west until opposite to the western extremity of the Isle of Wight. At its extremity, upon the point of a long sandy neck, stands Hurst Castle; from thence the coast runs west, forming the shallow bay of Christ Church, terminated at its western point by Hengistbury Head, from whence the coast still runs west to the borders of Dorsetshire.

The form of the Isle of Wight is that of an irregular rhomboid or lozenge. Its coast consists, for the most part, of precipitous cliffs or steep slopes. The unbroken face of a chalk ridge forms the south side of the bold promontory of which the insulated masses of chalk called the Needles have formerly been a continuation. From this point, which forms Scratchel's Bay, a line of chalk precipices extends to Freshwater Gate, in many parts nearly perpendicular, the western part, called the Main Bench, being 600 feet high. The chalk cliff is continued eastward, the height gradually diminishing till it terminates at Compton.

At the eastern end of Dorsetshire the coast is precipitous; but the cliffs extend scarcely a mile south-west from the border of Hampshire, and are succeeded by a low, sandy tongue of land, running about a mile further in the same direction to the narrow entrance of Poole Harbour. From hence a low shore runs southward nearly three miles, forming Studland Bay; and thence the coast runs to Weymouth Bay, the cliffs, for the most part, being a longitudinal section of the high land which forms this part of the coast. The shore of Weymouth Bay is low, and extends to the towns of Melcomb Regis and Weymouth: here the cliffs re-commence and run to Sandsfoot Castle, from whence a low shore extends to the Isle of Portland, which is one continued bed or rock of freestone.

The coast of the Bristol Channel, which bounds Devonshire to the north and north-west is, for the most part, steep and rocky; presenting, in several places very picturesque views, especially about Lymouth or Lynmouth —the mouth of the river Lynn, on the border toward Somersetshire, and at Clovelly, in Bideford Bay. The coast of the English Channel, which bounds the county on the south, is lined with cliffs throughout its whole extent. Tor Bay is bounded on the south by Berry Head. About two or three miles of coast on the west side of Plymouth belong to Devonshire. Plymouth Sound is three miles wide, and extends many miles inward; forming, with the estuaries of the streams that run into it, one of the finest harbours in Great Britain for extent and safety. It is secured from the heavy swell which formerly set into it by a breakwater, nearly a mile long, which extends across the middle of the Sound.

Devonshire exhibits a surface of accumulated hills, rising in certain districts to a considerable elevation, while innumerable hollows diversify the surface. Here the villages lie nestled, with walls of clay and crops of thatch, and usually near to one of the crystal streams which cheer every valley of this rocky county. Even the cliffs of the coast are gaily festooned with creepers. "The finest scenery is to be found in the north, between Lynton and Ilfracombe, where the off-shoots of Exmoor abut on the sea, or are based in woods and sub-Alpine ravines; and on the skirts of Dartmoor, which on every side are pierced by deep romantic glens, leading to desolation but clothed themselves with golden gorse and rock. When the vallies are warm, the visitor may, with little difficulty, refresh himself by agreeable changes both of scene and climate. From the cliffs of the coast, when requiring relief from the glare of the sun and water, he can hasten to the skirts of the moor, there to wander through shady dells, amid mossy rocks and mossy trees, or along the banks of pellucid streams; or he may explore labyrinthine lanes, and amuse himself with trout-fishing, or by sketching the weather-worn cottages of granite, slate, or *cob*—a concrete of mud and pebbles; or, if desirous of more invigorating exercise, he may ascend into Dartmoor, and there brace his sinews in the healthful mountain air, and delight his soul by grand misty views over those lovely hills."* Or, to take the guidance of other words:—

"He that through Devon's wilder scenes would stray,
Should seek, with pensive foot, each lonely cave

---

* Murray's Hand-Book on Devon, &c.

Where infant Lyn hath cleft his echoing way :
Or tall Clovelly's rock-bare trees, that wave
Beneath the Severn's blast: or that rude bay
Named of the shipwreck'd seaman's frequent grave :
Or when on Hartland's tempest-furrowed shore
Breaks the long swell from farthest Labrador.
 Or roam, if wilder scenes invite his eye,
Where shadowy Teign comes softly fleeting down :
Or where the silver Exe steals laughing by
Beneath the sunny slopes of Killerton :
Or farther south, where many a blended dye
By nature's magic hand confusedly thrown
O'er time-worn Tor, and steep depending wood,
Tints the bright course of Dart's romantic flood.*

The coast of Yorkshire is generally high, and consists in many places of precipitous cliffs. A few miles south-east of Whitby the coast-line turns rather more to the south, and is indented slightly by Robin Hood's Bay, which is dangerous. From this point the coast proceeds to Scarborough, from thence to Filey Head, and from Filey Bay the coast runs by Speeton Cliff to Flamborough Head,† which forms the extremity of a range of chalk cliffs, of brilliant whiteness, rising in many places to an elevation of 300 feet. From Bridlington Quay to the sharp-pointed promontory which terminates in the Spurn Head or Point, and which forms the northern boundary of the estuary of the Humber, the coast-line is very low and exposed to the inroads of the sea.

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* Legends of Devon.

† The name of the village of Flamborough is supposed to be derived from the practice of placing a light or flame at that part, in early times. It has long had a lighthouse, having a revolving light of sufficient intensity to be seen from a distance of thirty miles at sea.

Bridlington Quay and Filey have numerous visitors during the season: but the purity of the air at Scarborough, as well as its elasticity and bracing quality, finely adapt it to the restoration of health. Though exposed on the east coast, it appears from a table accurately kept during six years, that there were only 98 days in the course of each year, during which the winds blew from the east, north-east, and south-east quarters. The mean number of days in which the north wind blew during the same period of years, was forty-five days and a half. The bay, sheltered from the north and east winds, except the south-east, is open to the entire day's sun. The winters are therefore remarkably mild.

The ruins of its ancient castle are on a promontory, elevated 300 feet above the level of the sea, having at the summit an area of nineteen good green acres, terminating on three sides in a perpendicular rock, the fourth side, towards the bay, being a steep rocky slope. The inclination of the beach towards the sea is scarcely perceptible. The sea, in the month of August, is some degrees cooler than at Brighton, or any other place south of the Thames. Bathing may be enjoyed at all times of the tide, and in almost all sorts of weather, with security and ease. One of the most remarkable objects is the Cliff Bridge, erected on piers 75 feet high, over a chasm 400 feet wide, which separates the town from the Spa, between which place and the bridge there is a most delightful promenade, as there is also on the neighbouring cliffs. The scenery surrounding Scarborough is of a beautiful, and indeed, romantic character. A walk to Weaponness, or Oliver's Mount, little more than a mile from the town, is very delightful.

With this extended and greatly varied line of coast, stretching out and winding before the eye, let the decision where to go be judiciously made.

Leaving you also to decide whether the steam-boat, the railroad, or the two combined shall waft you to the coast, let it be remembered that whatever other enjoyments are to be had, some special ones will be derived from the intelligent use of the eyes. These, however, may be greatly assisted, not merely by the use of tinted glasses to defend them from too much glare from white surfaces amidst the brilliance of a summer's sun, and by spectacles—which, unhappily, so many young persons seem now to require—but by the telescope, as the instruments in the open windows facing the sea, and others swung round the shoulders of pedestrians, or carried in their hands, abundantly testify. There is yet, however, another companion which we wish to recommend; it is one of those pocket-glasses of several different powers, which will greatly aid minute observation of plants and animals when a microscope is not accessible. But when this can be had, it should be rendered available as supplying exhaustless amusement, and at the same time valuable instruction. As Humboldt says: "the application of the microscope increases in the most striking manner our impression of the rich luxuriance of animal life in the ocean, and reveals to the astonished senses a consciousness of the universality of life."

'Tis ever what's within our ken,
Owl-like, we blink at, and direct our search
To furthest Inde, in quest of novelties;
Whilst here at home, upon our very coasts,
Ten thousand objects hurtle into view,
Of interest wonderful."

CHAPTER II.

THE OCEAN.

"Thy shores are empires, changed in all save thee,—
Assyria, Greece, Rome, Carthage, what are they?
Thy waters wasted them while they were free,
And many a tyrant since; their shores obey
The stranger, slave, or savage,—their decay
Has dried up realms to deserts: not so thou,
Unchangeable, save to thy wild waves play—
Time writes no wrinkle on thine azure brow:
Such as creation's dawn beheld, thou rollest now."

Byron.

THE UNRUFFLED SEA—THE SEA INSPIRITING—IMMENSITY OF THE OCEAN—ONLY ONE SEA—THE TIDES—AN INCIDENT—THE RISING TIDE—SALTNESS OF THE SEA—EVAPORATION—TEMPERATURE OF THE SEA—COLOURS OF THE SEA—CAUSE OF WAVES—A SUMMER'S NOON—CLOUDS—A STORMY DAY—THE STORM—THE WRECK—THE LAW OF STORMS—BACKHUYSEN, THE PAINTER—THE GREAT RESERVOIR—A WORLD WITH NO SEA.

"The sea," it has been said, "is no mean comforter, while the earth is our theme, and the sea, like a mighty minstrel, playing before it, able, like David's harp, to make such as we almost forget the tempest and cares of life." Admirably indeed is it adapted to the various moods of the mind. If we love tranquillity, where can we behold it more distinctly than when we gaze on the ocean, still and waveless,—the unruffled bosom of the glassy sea? How soothingly serene is it in the evening of a fine summer day, when the sun has nearly reached the western horizon, the sea-breeze has died away in the offing, and the land-breeze has not begun to blow! Then the whole surface of the ocean is irradiated with golden light fading into delicate tints of purplish green; and even when the sun has declined, and hues of russet and grey contend which shall give more softness to the neighbouring landscape, all is silence; without the roll of a pebble, the gurgle of a ripple, or the rustle of a wing.

Are scenes of joyous activity preferred? Then may the spirit be stirred by the ocean waters, as a steady breeze along shore just curls the surface, and the whole is covered with dancing waves, fringing it where the rock juts forth, with its snow-white foam; and the distance as seen from the cliff fades off till it blends with the fleecy sky. Now the ship appears, with her sails well bent, and the light falling gently on their ample surface, apparently motionless from the steadiness of the breeze and her distance from the eye, but seen gliding from a horizon of many leagues extent; and followed by another and another until the sea appears peopled with life. And pleasant is it to think of cargoes fraught with means of enjoyment, of letters passing onwards to those dear to memory though lost to sight; of loved-ones long parted, but soon once more to meet; and of instruments for diffusing Christianity, that true and great civiliser of human kind. If thoughts like these appeal not now to the heart, and stir it to its profoundest depths, where, it may be asked, can be found such a power?

Assuredly, the mere sight of the "many-sounding" sea is refreshing and stimulating. Only look at it, and somehow you catch an influence which is never to be found away from the coast. Those thoughts spring up, and become clustered together, which we feel to do us good. The invalid goes to the beach to recover the tone and the strength that seem gone, and when he gains his object, has there not been experienced a medicine for the mind—an uplifting of the spirit from that scene of life and activity which is exhibited on the sea-shore? And who can be unmoved as he stands on some huge and beetling promontory, against whose base the billows of ages have spent their force in vain, while far in the distance the vast expanse stretches before us, variously shaded as the wind plays upon the surface, studded with rocks, with here and there a breaker chafing angrily, and telling by its spray and its sound of danger, and thus warning him off who would approach, as distance is safety. Then, too, at the base of the promontory, the surges foam and thunder, and dash the spray far upwards in broken jets, till it falls again, like a heavy shower; and as if the water were not a sufficiently mighty assailant, the waves, as if wrathful, take up the huge fragments which time and tide have severed from the cliff, and batter it with them with a fury only to be realised by those who have felt it necessary to stand bravely, leaning to the wind, with cap held tightly, and firmly clenched teeth, amidst the raging of a storm.

Who is not struck by the *immensity* of the ocean? With this, those who have stood on some vast promontory, or climbed to the mast-head of a vessel on its voyage, whence the eye roamed over the world of waters, have been most deeply impressed. Even a less extended range has called forth similar feelings, as Campbell had them when living at St. Leonards, he exclaimed:—

"Earth has not a plain
So boundless or so beautiful as thine;
The eagle's vision cannot take it in;
The lightning's wing, too weak to sweep its space,
Sinks half-way o'er it like a wearied bird:
It is the mirror of the stars, when all
Their hosts within the concave firmament,
Gay marching to the music of the spheres,
Can see themselves at once."

The ocean, surrounding the earth on all sides, penetrates into the interior parts of the different countries; sometimes by large openings, and frequently by small straits. There is, properly speaking, only one sea—one continuous fluid spread around the land. All the gulfs, all the inland seas, form only portions detached, but not entirely separated, from the one great ocean. It is only for the sake of convenience that we distinguish different parts of the ocean by the name of seas. The surface of the sea, compared with that of the land, is computed to be about 2¾ to 1; the one extending about one hundred and forty-four millions of square miles, and the other about fifty-two millions.

The idea of being in the neighourhood of all nations, and having one connecting pathway not only with all parts of the world, but with every island in the ocean, renders the contemplation of the sea so buoyantly expansive. The land, on which we take our position, has its limit; and should the mind stretch to a land beyond, there is perhaps a space between them, and we think of them as things of a different kind. Only to allude to the country nearest us, separated merely by the waters of the Channel, who does not regard it as foreign, and speak of a visit to it as "going abroad?" But the thought suggested by the ocean is one of unbroken continuity—undivided union; and the emotion called forth by it is, naturally, the common brotherhood of man.

"——— Distinct as the billow,
We're one as the sea."

On the sea-shore, you may resemble the poet as he said:—

"I saw the fearful main,
One molten mirror, one illumined plain,
Clear as the blue, sublime, o'er-arching sky;

and no less certainly, as he exclaimed:—

> "A breeze sprang up, and with careering wing
> Play'd like an unseen being on the water.
> Slowly from slumber woke the unwilling main,
> Curling and murmuring, till the infant waves
> Leap'd on his lap, and laugh'd in air and sunshine."

Every one who spends a day or two at the sea-side must observe that there is a time when the shores and banks are left dry and exposed to the air for some extent or other; and that no sooner has this exposure become greatest, than the water again begins to rise, and does so with varying rapidity, until it covers the highest extent of the shores and banks, to repeat this alternate elevation and depression again and again. Hence, the terms so commonly used: when the maximum is left bare, it is said to be *low water;* when the maximum is covered, it is said to be *high water;* the rise from low to high water is called the *flood tide,* and the time that it takes the *time of flood;* the descent from high to low water is called the *ebb tide;* and the time in which it takes place the *time of ebb.*

That the state of the tide depends on the attraction of the sun and moon appears from the fact that, at every return of new and full moon, there are high tides, and at half-moon, lower tides. It is evident, as the tide varies according to the age of the moon, that she does not act alone; for when the tides rise highest, she is in a line with the sun, and when they are lowest, she acts at right angles with the sun. In the former instance the tides show the result of the two forces in union, in the latter that of their opposing power. The first are called *spring*, the second *neap tides*. It has often excited surprise to find that, while the attractive power of the moon causes the waters vertically under her to be heaped up, the waters at the highest and lowest points beyond will be drawn away or depressed. But the difficulty will be solved if it be remembered that, though the moon acts more forcibly on the waters that are nearest to her than on the centre of the earth she also acts more strongly on the mass of the earth than on the waters which cover the part most distant from her.

The unexpected rise of the tide on one occasion caused a wild-fowl shooter, on the low flat shore opposite the Isle of Wight, to meet with a singular adventure. Traversing one of these mud-land plains, he was so intent on the quest for ducks that the tide had made an alarming progress around him before he was actually aware of his peril. Run where he might, he could not escape; and at length, as the only hope of safety, he returned to a part as yet uncovered by the water, and sticking the very long barrel of his fowling-piece deep into the mud, he resolved to hold fast by it as a support against the waves. He supposed that the tide at that place did not reach above his middle; but this being a spring-tide, with a strong westerly wind, the water soon rippled over his feet; it gained his knees and his waist, and soon button after button of his waistcoat disappeared, till, at length, it covered his very shoulders. Now his last hope was quenched, and he gave himself up for lost.

Holding fast still by his gun, his eye eagerly searched for a boat that might extricate him from death; but none appeared. He was unable to raise any signal of distress; and a solitary human head, sometimes covered by a wave, was not likely to be descried from the distant shore. His fears were likely to be fully verified, when he suddenly thought the uppermost button of his waistcoat began to appear, yet so great was the fluctuation of the water, and so slowly did the tide turn, that some time elapsed before he was satisfied that the waters were really subsiding. But now, to his indescribable transport, a second button was visible; a sight which gave him spirits and resolution to support his uneasy situation four or five hours longer; after which the waters permitted him to return home.

The writer well remembers being placed with a party of friends in a similar, yet comparatively a trifling difficulty. They were intently occupied in looking for whatever might be found on a low and far-extending sand, when the fast-rising tide suddenly wetted their feet, and it was only by determined efforts that they escaped a further submersion by the waters, which rapidly covered the space far beyond that on which they first stood, and chased them to the low rocks beyond. Scarcely does a year elapse without tidings of some persons not being so successful, and having to make signals from a greater height, in hope that some observer may be induced to come to their rescue; while in these circumstances many have been lost.

It is worthy of remark, that the advance of the tide produces a change in the aspect of some rivers conferring important advantages. The Avon is only a shallow brawling stream, scarcely navigable by the smallest craft at St. Vincent's rocks; but no sooner does the tide flow than nearly 40 feet are added to its depth of water, and capacious steamers and noble West Indiamen by its means communicate directly with the city of Bristol.

The *saltness* of the sea is well known; but not so is the reason of this phenomenon. That it is not designed to prevent stagnation, is evident from the fact that inland lakes of fresh water do not stagnate. Nor is its purpose to prevent putrefaction, as it is not water, but the bodies it contains, that experience this change. It seems probable that the reason for the sea being salt is the increase of its weight without enlarging its bulk. Were it lighter, the swimmer would not so easily float on its surface, amuse himself by his various gambols, or require such an effort to be made when he resolves to dive to its depths. The gravity of the ocean, too, allows it to be "the silent highway" of commerce, so that it may be traversed not only by vessels so light that they seem to dance on the waters, but by others of huge bulk, with their cargoes, properly called their "burden," amounting to hundreds or thousands of tons. Nor should it be overlooked, that as any increase of one of the constituents of the atmosphere might change health into sickness, and life into death, equally disastrous would be any diminution of the gravity of the ocean in disturbing the motions of the earth, and, therefore, the harmony of the planetary system.

It is a curious fact, that taking a very low estimate of the mean depth of the ocean, about 1,000 feet, the entire amount of common salt may be reckoned at 3,051,342 cubic geographical miles; an aggregate equal to five times more than the mass of the Alps, or one-third less than that of the Himalayas. Not that the amount of saline matter is uniform throughout the waters of the sea. On analysing its proportions of salt in the Mediterranean, Atlantic, German, and Arctic oceans, it has been shown that the quantity of salt diminishes towards the high latitudes, and also near the shore. This difference is owing to the melting of the polar snows, and the volumes of fresh water poured in by the rivers.

Here there is another interesting phenomenon. If we dissolve a certain quantity of common salt in a glass of water, we have a saline mixture in the proportion of the one to the other; and, of course, diminished in strength according as the quantity of water is increased. As, then, millions of tons of fresh water are being poured every moment into the ocean from the rivers which enter it, how is it that its ordinary gravity remains the same? The question, too, acquires emphasis from the fact that as, if we were to take the saline mixture we first prepared, and subject it to the action of heat, the water would be evaporated to a greater or less extent, and the salt water that remained stronger or weaker, so a similar change might pass on the sea. Evaporation is there going on at an astonishing rate. It has been calculated, indeed, that there is raised in vapour from the Mediterranean nearly three times the quantity of water that is poured into it from all the rivers. As the wise man said: "All the rivers run into the sea; yet the sea is not full; unto the place from whence the rivers come, thither they return again;" so it has been, and so it shall be, till the consummation of all things. He who "weigheth the mountains in scales, and the hills in a balance," adjusts no less exactly the saltness of the sea; causing that which is taken up by evaporation to be restored by the rain that falls upon it, or by the rain and the snow which, alighting on the land, feed the mountain streams and rivers, and hurry back to their source.

The waters of the globe exhibit changes of *temperature* under the influence of changing seasons; but, as they conduct heat slowly, such vicissitudes are not so violent or sudden as in the atmosphere. They are chiefly observable in the upper strata. The temperature of the ocean's surface is generally lower at mid-day than that of the atmosphere noticed in the shade; at mid-day it is always higher. In the ordinary state, its surface from the equator to about 48° of north and south latitude, is somewhat warmer than the stratum of air which immediately rests upon it. Banks diminish the temperature of the sea, so that it is always colder over them than when it is deeper, and the difference is greater the greater the shallows. The seasonal changes of air do not affect the ocean beyond the depth of about three hundred feet. Meanwhile it is experiencing other changes.

"Nor on the stage
Of rural landscape are there lights and shades
Of more harmonious dance and play than thine.
How vividly this moment brightens forth
Between grey, parallel, and leaden breadths,
A belt of hues that stripes thee many a league,
Flushed like the rainbow, or the ring-dove's neck,
And giving to the glancing sea-bird's wing
The semblance of a meteor."

The ocean exhibits, in fact, an immense variety of tints, which depend on a great diversity of circumstances; and as many of the causes are fluctuating, so the hues change. As it absorbs all the prismatic colours except ultra-marine, and reflects this one in every direction, it exhibits it, darkening with increasing depth, when sheltered from extraneous influences. Among the more general sources of deception is the aspect of the sky: as an apparently dark-coloured sea is a common prognostic of an approaching storm; not that the water is actually darker than usual, but because the dark colour of the clouds indistinctly seen, or reflected from the waves, is mistaken for the colour of the sea itself. Whatever other colour the sky happens to wear has a greater or less influence on the appearance of the ocean, as red or golden clouds tinge it with their respective tints. On some occasions the edges of the waves, by refracting the solar beams like a prism, exhibit all the brilliant colours of the rainbow; which is still more nearly imitated by the refraction of rays in the spray. In other instances the yellow and bright green shades of the sea are attributable to living marine vegetables which grow at the bottom, stretch their fibres through the water, or spread over the surface. Near the shore, and especially towards the mouths of rivers, the diffusion of mud and other earthy matters cannot fail to affect the colour of the sea. Where it is shallow or very transparent, the colour of the bottom produces an illusion.

"For oft the foggy banks on ocean lie,
Lift the fair sail, and cheat th' experienced eye."

Yet, whether the surface of the ocean is dark or bright:—

> "Aye, when the eye delights, yet dreads to roam,
> The breaking billows cast the flying foam,
> Upon the billows rising,—all the deep
> Is restless change,—the waves so swelled and steep;
> Breaking and sinking, and the sunken swells,
> Not one, one moment in its station dwells.
> But nearer land you may the billows trace,
> As if contending in their watery chase,
> May watch the mightiest till the shores they reach,
> Then break and hurry to their utmost stretch;
> Curled as they come, they strike with furious force,
> And then, reflowing, take their grating course;
> Making the rounded flints which ages past,
> Rolled by their rage, and shall to ages last."

The cause of waves may be readily understood. When a stone falls into the water, as the liquid is not compressible a part of it is displaced sideways, and thus becomes a circular elevation around the stone. This wave, obeying a law which regulates fluids, spreads outwards. A hollow, left for a moment where the stone fell, is soon filled up from the surrounding pressure, but chiefly by a sudden rush from below. The rising water, however, does not stop at the exact level of that around, but, like a pendulum, sweeping past the centre of its arc, it rises almost as far above the level as the depression was deep. The elevation in the centre now acts as the stone did originally, and causes a second wave, which pursues the first when the centre subsides; and like the pendulum becoming still, it sinks again almost as much below the level as it had mounted above it. Hence it has to rise again, again to fall, and repeating the ascent and descent, it sends forth a new wave at each alternation.

The velocity of waves has relation to their magnitude. Those which are very large, are supposed to proceed at the rate of from thirty to forty miles an hour; though it is commonly imagined that the water itself advances with the speed of the wave, it is, in fact, only the form: the substance, excepting a little spray above, rises and falls in the same place, with the regularity of a pendulum. But when a wave reaches a shallow bank or beach, the water becomes really progressive; for as it cannot sink directly downwards, it falls over and forwards seeking the level. It is stated by those who have gone down into the ocean in diving bells, that when they are there they do not know whether the wind blows hard or soft, and that when the sun shines it is as bright as it is above in a cloudy day.

The sea is specially to be enjoyed when the land has long suffered drought, and all upon it is languishing under the extreme fervour of the sun. Then the ponds are empty, the mill-streams dry, and the ordinary river shrunk to a mere rivulet. The parched common invades the woodland to the very leaves of the trees, and the leaves of those nearest it already wear the tints of autumn. The throbbing temples and the burning cheek find no solace even in the woodland shade, for the thirsty air has parched the foliage, and the branches can barely maintain their life. The notes of birds are no longer heard; and as the burning air has drained every nectary of its honey, there is no hum over the drooping flowers. The sun sinks in the west like a cloudless globe of fire; and when it rises again, it is no "meek-eyed morn, mother of dews." It is hotter even than yesterday; the earth has a metallic ring when struck by the foot; the sky is as a dome of brass; and even before the sun has gained its meridian height, all nature is again silent. Then we long for a sea-breeze to fan the earth into life. But though the ocean is still living water, there is perhaps only a gentle ripple, showing a play of delightfully transparent colours, and the gurgling among the pebbles is subdued, and a thread of silvery foam marks where the refreshed land and the refreshing waters meet. Or, as Crabbe has said:—

——————— "A sandy space
The ebbing tide has left upon its place;
Then just the hot and stony beach above,
Like twinkling streams in bright confusion move:
(For heated thus, the warmer air ascends,
And with the cooler in its fall contends).
Then the broad bosom of the ocean keeps
An equal motion; swelling as it sleeps,

> Then slowly sinking; curling to the strand,
> Faint, lazy waves o'er creep the ridgy sand,
> Or tap the tarry boat with gentle blow,
> And back return in silence, smooth and slow.
> Ships in the calm seem anchored, for they glide
> On the still sea, urged solely by the tide.
> Art thou not present, this calm scene before,
> When all besides is pebbly length of shore,
> And far as eye can reach, it can discern no more?"

At the sea-side clouds should often be contemplated, visible vapours, as they are, formed into masses. This process takes place generally in high regions of the atmosphere under the action of currents, from a decrease of temperature, and a due supply of aqueous elastic vapour. As it may occur in one stratum and not in another, there may be obviously a great diversity in the appearance of the sky, patches of the clear blue of the sky alternating with these vapourous fabrics. The clouds are supposed to consist of minute globules of water filled with air; but how they are suspended aloft is one of the numerous questions to which no satisfactory answer has yet been given. The clouds float at different elevations, but the higher we ascend the drier the atmosphere is found, and the less is itladen with vapours.

So diversified are the forms of clouds, that any classification of them appears to be hopeless; and yet the division of them into seven kinds is a clear approach towards success. The *curlcloud* * is the most elevated;

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* Cirrus.

it displays light, flexuous, or diverging fibres, sometimes shooting forth from a nucleus in all directions, and has been likened not inaptly to a crest of feathers or a lock of hair. The curlcloud is supposed to indicate variable weather; when most conspicuous and abundant to precede high winds and rain; and when the fibres point in a particular direction for any length of time, a gale may be expected to blow from that quarter.

A vast hemispherical or conical heap rising gradually from an irregular horizontal base and increasing upwards, has been called *cumulus*, a pile or heap, and *stacken* cloud, that is, a number of clouds stacked into one large and elevated fabric. Its appearance varies; it may be called appropriately the day cloud; it often exhibits a brilliant silvery light, and when in opposition to the sun, its copper tinge shows that the atmosphere is then highly electrical.

Another vaporous fabric appears at eventide, reaches its greatest density soon after midnight, and usually vanishes with the dawn of day. This is called the *fall cloud*,* and includes the fogs and creeping mists which at certain times cover the surface of the land and the water. It supplied the image of Ossian:—"The soul of Nathos was sad, like the sun in a day of mist, when his face looks watery and dim," and that of Beattie:—

"And oft the craggy cliff he loved to climb,
When all in mist the world below was lost.

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* Stratus.

> What dreadful pleasure ! there to stand sublime,
> Like shipwreck'd mariner on desert coast,
> And view the enormous waste of vapour, toss'd
> In billows lengthening to the horizon round,
> Now scoop'd in gulfs, with mountains now emboss'd !
> Flocks, herds, and waterfalls, along the hoar profound."

The fallcloud struggles sometimes successfully with the sun till it has nearly reached the meridian, and even throughout the day.

One form of cloud is formed of the cirrus and cumulus, hence it is called *cirrocumulus,* or sondercloud. Sometimes the cirrus becomes thus modified and finds a lower place in the atmosphere, at others the sondercloud starts independently into existence ; thus it partakes of considerable variety. Its prevalence in summer presages an increase of temperature ; and in winter the termination of frost. At night when the moon is shining it realises Bloomfield's description :—

> "The beauteous semblance of a flock at rest."

The *cirrostratus* or *wanecloud* arises from fibres of the cirrus warring in the atmosphere, becoming closer to each other, and then arranged in horizontal strata. It exhibits several varieties, and indicates in its prevalence, wind, rain, or snow. It is certainly one of the most beautiful forms of which clouds are susceptible.

The *twaincloud,* * however, is the most magnificent of all; appearing in mountain masses, and resting on a common stratum; its eminences appearing like the domes of an aerial city, shining with a strong silvery or golden light, rendered more impressive by the central masses which are dark and dense. It often presages thunder, and may precede a tempest of snow.

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* Cumulostratus.

Any of these clouds may so increase as to threaten rain, yet not a drop may fall, unless a modification takes place in the cumulostratus, which may become lowering, and as the darkness is formed by a lighter shade, as that of grey, the *raincloud* * arises which, though less interesting to the eye, is especially attractive when the rainbow is thrown athwart the gloom.

A strange scene is presented by a stormy day on the coast; when garments are blown forwards, as if madly intent on leaving their wearers, and unfastened hats and caps go whirling in the air. There is rain perhaps, but no sun, except indeed that early in the day, a narrow line of palest silver fell on the horizon, shining here and there. The outlines of distant vessels are scarcely discernible, and what is first seen rapidly fades on the view. Others, with sails set, make for the harbour; pilot-boats are rowed out from thence to meet them; the tide rolls in, leaving the foaming waves at its entrance; where all kinds of vessels, from ships to fishing-boats, appear at short intervals, dash down among the foam, and rush into the port. So low do the little black boats around them often sink in the surge, as now and them to become invisible. The harbour, which some hours since, was flooded with a silver light, now grey and dull, contrasts quietly with the waves that still foam, and dash, and break at its entrance. The horizon thickens, and the scene around seems to close in, but the vessels as they approach, though darker, become more distinct, the sails of some half set, and others with almost all their canvass spread. All keep away a little to the westward as the wind is south-west, then change their course, and dashing round the lighthouse pier-head, toss the foam high above them, while some, pitching head foremost, as if going to the bottom, and then rolling helplessly and reeling in, settle themselves safely in the still waters.

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* Nimbus.

Far different is the fate of vessels which, outward-bound, are struggling with the waves. So huge are those masses, and so rapid is their succession, that before the ship, in her descent, is half-way down the abyss between them, the next sea often collects to a tremendous height above her bowsprit, over which, at the moment, it appears absolutely impossible for her to rise. Frequently, however, does she mount and ride on the summit; but as she plunges from the top of one wave to the gulf below, and after a momentary pause is forced up to the light of the air, every timber groans, and at times she trembles in her keel, as if actually foundering in the struggle. Waves raised by the wind in the open sea are, however, rarely more than twenty feet in height, measuring from the top of the crest to the bottom of the trough. In what is called "genuine Cape Horn weather," every swell of the waves seems a mile in extent, having what the sailors call a "long foot:" the sea rising and falling gradually and majestically, not shortly and abruptly as it is generally seen, especially in the Bay of Biscay. And yet the greatest height of these unbroken sea waves is estimated at not more than from thirty to forty feet. Waves are only "mountains high" when the imagination becomes excited, and exaggerated expressions in consequence arise.

Yet words fail adequately to describe the terrors of a storm, when the ill-fated vessel of the merchantman becomes its victim. Of how many, alas! has it been said:—

"On India's long-expecting strand
Their sails were never furl'd;
Never on known or friendly land,
By storms their keel was hurl'd:
Their native soil no more they trod,
They rest beneath no hallow'd sod;
Throughout the living world,
This sole memorial of their lot
Remains,—they *were*, and they are *not*.

"The Spirit of the Cape* pursued
Their long and toilsome way;

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* The Cape of Good Hope, formerly called the Cape of Storms.

At length, in ocean solitude,
He sprang upon his prey;
'Havoc!' the shipwreck demon cried,
Loosed all his tempests on the tide,
Gave all his lightnings play:
The abyss recoiled before the blast,
Firm stood the seamen till the last.

"Like shooting stars athwart the gloom
The merchant-sails were spread;
Yet oft before its midnight doom,
They mark'd the high mast-head
Of that devoted vessel, tost
By winds and floods, now seen, now lost;
While every gun-fire spread
A dimmer flash, a fainter roar:
—At length they saw, they heard no more."

Melancholy indeed is the spectacle which sometimes meets the view, when a hull appears dismasted, water-logged, its upper works only floating occasionally above the waves, when a transient repose from their still violent undulations permits it to reassume its buoyancy: one moment deluged by the seas which break as they pour over its gunwale, and the next, rising from its submersion as the water escapes from the port-holes at the sides.

It may seem strange to speak of "the law of storms," yet to this much attention has recently been given. The winds of the temperate zones are accordingly found to blow in a circular direction; as a storm, if marked out on a map or globe, would describe a circle, often many degrees in diameter. Still the direction of the gale is not arbitrary; it seems, indeed, to proceed invariably from north to south, and east, in the northern hemisphere, while in the southern it takes the opposite course. As in the midst of the southern Atlantic storms are unknown, and magnetic power is at its minimum of intensity; while in the meridians of the magnetic poles, tempests, hurricanes, and typhoons are frequent, it appears that electricity, a development of the same principle as magnetism, has much to do with the changes of the atmosphere. In such studies, we are, however, only at the outset; who can tell what remains within the compass of human thought and research?

The sea, in its various aspects, has often furnished a subject for the artist. Young Vandervelde greatly surpassed his father as a painter; his calms and his storm-pieces are equally excellent, and are remarkable for their delicacy of drawing and transparency of colouring. The delight of Backhuysen was the gale and the storm; his practice being to induce boatmen, by large rewards, to put to sea at times when no other person would venture from shore. Amidst the dashing of the waves, the roaring of breakers, the crashing of thunder, the zig-zag and the sheeted lightnings, and the danger of vessels, he, perfectly composed, made his sketches; and the moment he landed, hastened to his painting-room to transmit his impressions to canvass. The number of his productions is astonishing. His works are fair specimens of the Dutch school, in richness, transparency, delicate handling, and appropriate colour. He had the art of giving depth without darkness; frequently in his pictures of an approaching storm the very atmosphere seems to labour with gloom, and yet the clearness and even vivacity of effect are not the less unimpaired.

We must now turn from the ocean; but it will be only to look on, to mark its hues, to observe its tides, and to watch its rising and falling waves again and again. As a wondrous cistern of scarcely conceivable extent, it receives the waters which flow into it only to distribute them far and wide. As from every point in the human body, a little vein endued with living power takes the blood, which has just conveyed to it life and nutriment, and then delivers it into a larger vein, until at last, in the great reservoir of the heart, it meets the blood returned from every part of the body, so it is in this globe of ours. The moving power is simply fluid seeking its level; and so does the rain which falls to sustain vegetable and animal life, and to renovate nature, glide from every point of the surface into a lower bed, and from thence into a lower still, until the countless streams so formed, after every variety of course, combine to form the swelling rivers, which return the accumulated water into the common reservoir of the ocean. In the living body, the arteries carry back the blood, with renewed vitality, to every point whence the veins had withdrawn it, thus completing the circulation. And just so, the circulation of which we now speak, by comparison, is completed by the action of heat and of the atmosphere, which, from the extended face of the ocean, raised the watery vapours which the winds then carry away, and deposit as rain or dew, on every spot of the earth.

"It would be idle," says Dr. Harvey, "to speculate on what the world would be had the ocean no existence. Its physical aspect may, perhaps, be illustrated by what we know of the condition of the moon, where the existence of water has been, by many observers, questioned, and where the surface presents frightful gulfs and enormous mountains, supposed to be the result of powerful volcanic action. Such we may conceive would be the issue of a purely mineral world, formed, like the ball of the earth, of numerous elementary substances, endued with chemical affinities, and placed in juxtaposition, so as to be capable of acting on one another. In such a case, a violent effervescence or chemical action would take place:—metals would be oxydised; acids formed, which, uniting with the oxydised metals, would produce neutral salts; and these, and similar changes, would be repeated until every chemical attraction had been satisfied. There would then be no further change, and we should have a *world,* if such the 'lifeless lump' could be called, formed of neutral salts and cinders, for ever revolving in space, without a history or an aim, and while partaking of God's sunshine, offering Him no tribute of good fruits in return. That such is not the fate of our planet is due to the ocean. This is the fountain of organic life, as it is also of every rill that waters the soil, and every cloud that cools the air. Without it, no green herb would clothe the pastures, nor would 'the valleys be covered over with corn';—neither could 'anything wherein is the breath of life' exist on the face of the whole earth. And if these things constitute what is, indeed, 'the world,' apart from its framework, most truly and forcibly is it said, 'He hath founded it upon the seas, and established it upon the floods.'"

Who, then, will not say:—

"Roll on, thou dark blue Ocean, roll."

CHAPTER III.

THE SEA BEACH.

Now 'tis high water, and with hundreds more,
He goes to catch a breeze along the shore;
Or pace the crowded terrace, where one sees
Fashion and folly, beauty and disease.
—The waning belle, come down to sport her face,
And try her fortune at a watering-place;
The alderman, wheel'd out in gouty chair;
The love-sick girl, sent down for change of air;
The sickly child, to bathe his crippled knee;
The hopeless hectic, come to try the sea;
The queer-faced artist, standing like a post,
To watch the effect of sunset on the coast:
Then one, perchance, who differs from the rest,
As much as——O, too much to be express'd;
He, Nature's genuine lover, casts his eye,
Lit up with intellect, on sea and sky,
Drinks in the scene, and feels his bosom swell
With what he could not, what he would not tell.
As to the others, though like him possess'd
Of eye, and ear, and heart, and all the rest,
(At least, if some might question it, I know
Any anatomist would tell you so)
See not, nor hear, nor feel a word of this,
But find in common objects common bliss.
To them the sea is water, and the sky

So full of stars, they think, and blue and high :
Delightful, charming, pleasant, they agree,
—All that of course—one must admit the sea ;
And then they gape and turn, or stop to chat
With Mrs. *This*, and then with Mr. *That*.

JANE TAYLOR.

MARGATE SANDS—RAMSGATE SANDS—SEA-BATHING—ULVERSTON SANDS—SCARBOROUGH SANDS—SAND-RIPPLE—GRASSES—SAND-REEDS—FLOWERS—THE SEA BEET—THE SAMPHIRE—THE CHESIL BANK—HOW ARE PEBBLES FORMED ?—AMBER—JET—CORNELIAN—STORY OF A PEBBLE.

The coast, from the Isle of Sheppey to the North Foreland, is skirted by sands which extend from a quarter of a mile to a mile from high-water mark ; and for some miles further out by " the flats," which, except in Margate Roads, rarely afford, when the tide is down, more than two fathoms of water. Margate Roads are sheltered to seaward by Margate Sands, which are dry at low water ; and are frequented, during the season, by multitudes of visitors. Look, for a moment. at that long broad ridge which becomes, whenever the tide is down, a favourite resort. See the children, all hilarity, running, jumping, or digging up sand with their spades, amidst an admiring group of those who are younger than themselves ; the healthy pedestrians tripping gaily along ; here and there the slowly-drawn chair of the invalid ; while not far off are riders of both sexes, and carriages whose living contents we are unable to discriminate.

As noon approaches there is a strange bustle and a queer medley of characters on the Ramsgate sands. The bathing-machines are now full; and therefore those who resemble "patience on a monument," occupy the chairs let out for an indefinite time at "only a penny," or squat on contiguous jutting stones, or lumps of chalk. Hawkers go hither and thither, with cheap and gaily-coloured books for all ages; wooden spades for the children's favourite manufacture of "sand-pies" and hills; sand shoes for delicate feet of both sexes; and shells of divers hues, and forms, and gay iridescence, with sea-weeds and corallines in rich variety and abundance. Here is a blue-dressed dipper doing what she can to assuage the fears of some delicate girl, whose plump and robust mamma has resolved that she should bathe; and there is a "strong-minded" lassie, who means, whether she avows it or not, "to strike out," and have a swim to herself. There is a strange hum of human voices wherever you may wend your steps; while shouts arise from the boys who urge their horses seaward and landward with their varied loads of humanity. Many an eager pair of eyes will be on the look-out for the first open door; and now and then there is a restraining of too rapid steps, with the intimation that the machine is engaged, but that another will be speedily at liberty.

Meanwhile

"The bridegroom sea
Is toying with the shore, his wedded bride;
And in the fulness of his marriage joy,

He decorates her tawny brow with shells,
Retires a space, to see how fair she looks,
Then proud, runs up to kiss her."

The hour for sea-bathing must, in some measure, depend upon the tide; but generally speaking it will be found most serviceable as near the hour of noon as possible; this will be a sufficient time after breakfast for even the invalid to have taken exercise. A sudden plunge into the ocean causes the blood to circulate briskly, and promotes the heat of the body. Many persons creep into it step by step, and do not like to put their heads under it at all; or if they do, not until they have delayed the dip so long that the shock comes too late to excite their vital energies, and they leave the water trembling. This is a great mistake; and another is to continue long enough in the water, when bathing for the health, to become tired or chilled. Whenever there is a tendency to internal congestion of blood, much caution should be exercised in taking the cold sea-bath; and when it is tried, persons ought not to immerse themselves suddenly, but gradually, in the water. The time of remaining in the bath, in the case of invalids, must depend, in a great measure, on personal strength.

In learning to swim, the person should walk into the water so deep that it will reach the breast. He should then lie down quietly on the water, keeping the head and neck perfectly upright, the breast advancing forward, the chest inflated, and the back bent; then withdrawing the legs from the bottom, and stretching them out, the arms should be struck forward in unison with them. Swimming on the back is somewhat similar; but with this difference, that although the legs are employed to move the body forward, the arms are generally unemployed, and progressive movement is made by the motion of the legs. No one can be a swimmer except in placing confidence in the water to yield its support. Nor will any one sink so long as the hands are kept under the water; and not, as is commonly done from fright, raised above the head.

The formation called Hastings Sand consists of numerous beds of that substance, sandstone, grit, fuller's earth, and other materials. On the coast it extends from Bexhill, in Sussex, to Ham Street, near Aldington, in Kent. The district occupied by it is in the form of a long narrow triangle, the base being the line of coast; the apex is at Saxwood, ten miles west of Horsham.

Slapton Sands are, in fact, a high sandy beach, on the route from Exeter to Plymouth, now traversed by a carriage road. Here the visitor finds a vast bank of small stones rather than sand; they are piled up along the coast almost uninterruptedly, to within a short distance of the headland called the Start. As the shore is exposed to a long range of breakers, and as the shingle cannot travel so as to escape out of the bay, the accumulation has taken place.

Mrs. Hemans says, in one of her letters:—"I must not omit to tell you that Mr. Wordsworth not only admired our exploit in crosssing the Ulverston Sands as a deed of 'derring do,' but as a decided proof of taste; the lake scenery, he says, is never seen to such advantage as after the passage of what he calls its majestic barrier." The fact is, that by the ebbing of the tide in Morecombe Bay, these sandy tracts, usually called Lancaster Sands, are twice a day, to the extent of several miles, left perfectly dry, except in the channels of the rivers Kent and Leven, and they may then be passed by vehicles of every description. From Hest Bank, the point of entering upon the sands on the eastern shore, to Kent's Bank, is a distance of eleven miles. Three miles of solid ground are then crossed, and three miles of sand follow, lying between the shores of the Leven estuary. Midway between these shores, and on the south of the usual track, there is a small island, bearing traces of a chapel or oratory, built by the monks of Furness. No one should, however, attempt to cross without due enquiry being first made at Lancaster or Ulverston. The proper time for doing so may be easily ascertained, and the road safely traversed over a sandy level, stretching far and wide, the whole of which will be covered by the sea a few hours after; when there will also be a delightful view of the distant mountains, and the crags and scars rising from the edge of the plain. But for want of care, and from the reckless hardihood which characterises many, few years pass without some lives being lost in this interesting district of our country.

As the sun, long past its meridian, casts its beams on the magnificent scenery around, the visitors to Scarborough resume the movements of the morning. Long lines of pedestrians proceed from the cliff to the bridge, and, passing through the toll-bar, deploy themselves over that stupendous structure, making it their afternoon promenade. Groups and parties extend themselves meanwhile as far as the tortuous paths on the opposite hills. Others track the broad sand from which the waves have but lately retired. To the right, the soft yet fair and level sands extend as far as the distant wall of the New Spa, which is accessible at low water from the strand, by means of steps rising from the sub-basement of the Spa-terrace. On the left, an equally level and wide zone of sand appears, stretching as far as the piers of the little harbour, skirting the foot of the Castle-hills. Here horses take their morning exercise, sniffing the gentle sea-breeze; and here it is enjoyed during the after-hours of the day, if not by "belted knights," yet by "ladies fair," with such attendants as interest or affection may gather around them.

All must have observed, when walking on the sands of the sea-shore, that if the water has been agitated by the wind, the surface of the mud or sand is furrowed more or less deeply by the rippling of the waves. The markings present various appearances, according to the force and direction of the wind and currents. The undulations on the surface of the sandstone, clay, and limestone, exposed in recent falls of the cliffs along the southern shores of the island, have arisen from similar operations. The stone is often so rough as to be used in stable-yards, where an uneven surface prevents horses from slipping as they pass over it. Sometimes the furrows are deep, showing that the water was much agitated and the ripple strong; at others the undulations are shallow, and intersected by cross-ripples, indicating a change in the direction of the waves. Some slabs are covered by slightly elevated, broad ridges of sand, made up of gentle risings disposed in a crescent shape; these have been produced by rills flowing into the river, during the recession of the tide. The rippled surfaces often bear traces of the trails of various marine creatures. Near Etaples in France, there are ripple marks on a large scale. Crescent-shaped hillocks may be observed, many of which are more than a hundred feet high. The height is greater in the middle of the crescents; it declines towards the points. The slope on the inner side of the crescent, which is remote from the prevailing direction of the winds, is much more rapid than that on which it strikes.

Another striking fact occurs, when men removing huge blocks in succession from a sandstone rock, come to a surface which bears the marks upon it of the feet of animals. Thus it is manifest that ages ago, when that surface was not only uppermost, but soft and moist, some living creatures passed over it, leaving impressions of their footsteps, from which what they actually were may now be ascertained. The visitor to the British Museum may there see the tracks of the feet of Cheirotherium on a slab of sandstone, from Storton-hill, near Liverpool; and, just at hand, a plaster cast of a sandstone slab, showing the imprints as they must have appeared on a bed of clay below, and a portion of sandstone stratum, exhibiting in relief a counter-impression of the imprints in that bed of clay.

Nor are such impressions restricted to those of animals of considerable size. On sandstones of the Wealden formation, in Sussex and Dorsetshire, have been discovered perfectly preserved and petrified castings of marine worms, at the upper extremity of holes bored by them in the sand, when it was yet soft at the bottom of the water; and within the sandstones, traces of tubular holes in which the worms resided. Even the rain-drop, a singular unmistakeable marking, has been detected on sandstones. These impressions have been described and adopted by men of science as the true veritable indices of the showers and cloud-falls of the old world. The very size of the drop may be measured, the thick pattering of the rain compared with the scanty or copious shower of the present day, and the exact point detected from which the wind blew on the day when the showers fell.

We pass now from the inanimate to the animate; and assuredly, life elevates all that is endowed with it far above the range of inert matter: though towering as the mountains in grandeur and sublimity; brilliant as the diamond or the ruby; fruitful as the soil to which we owe our corn and flowers and trees; essential as the atmosphere, with its piles of silver and golden clouds; or indispensable as water, which flows in the river, dances in the brook, tinkles as it drops on the cavern floor, murmurs in the rill, rushes in the torrent, dashes in the cascade, and roars in the great sea-wave. Yet, even water, of all inanimate things approaching most nearly the animate, is not alive; life stands forth at an impassable distance from it, absolutely and eternally unique.

Look at those grasses, as the sea-side barley, the sea wheat-grass, and sea cat's-tail, beside several of the rush and reed tribe, which are of great service. Thus, in the salt marshes they are found very useful for cattle. Still more, they bind the sands firmly together, which would otherwise become the prey of winds that can bear the spray of the ocean to the distance of miles from its shores. The long and sweeping roots of the great sea-carex, those of the upright sea lyme-grass, and the sea-reed or matweed, have, therefore, been cultivated in Norfolk, on our own coasts, for this express purpose.

As the sand-hills drift, the sand would overwhelm the neighbouring soil; but this evil is averted by the sea-reed* and the sea lime-grass.† Growing wild, they establish themselves in the loose soil, and as it becomes consolidated, they gradually disappear.

It is believed that the town of Hull would have long since been covered by the waves were it not for the sand-banks at Spurn Point, bound together by some of these plants. The shores of Holland, those which lie between Boulogne and Dunkirk, especially in the tract near Calais, and some places on the Welsh coast, owe their preservation to the same simple yet effective means.

The sea-carex,‡ the small sand-reed,§ and the sand-plantain‖ have, by cultivation, rendered important service to man. Large districts have been reclaimed from barrenness and clothed with stately forests, and countries exposed periodically to an invasion of sand from the prevalence of certain winds have been saved by these plants from such calamities. Bremontier, an engineer, first tried their culture on the coast of Gascony; sowing in the driest and most shifting sand, the seeds of the broom,* mixed with those of the sea-pine,† and then covered over the spaces thus sown with branches from the pine forests; and thus the shifting of the sand was somewhat restrained. The broom springing up first, not only aided in doing this, but nursed the young pines, while the foliage of these trees, sheltered by the broom, yearly mingling with the sand, tended to its fertilisation. After seven or eight years, the pine overtopped the broom, and frequently killed it by its shade. In ten or twelve years the rising forest was thinned for the manufacture of tar, and for procuring branches to cover the districts newly sown. In twenty years a fall of the trees commenced for the manufacture of resin; and thus these forests, reared on the sand-hills between the mouths of the Adour and the Garonne, defended the whole country behind them from the encroachments of the sand, and supplied an important article of commerce. Flowers may be observed to spring up among the sea-grasses from the sandy shore; and there the great sea-rush rises in tufts in solitary grandeur. The polished chestnut capsules clustering upon it are very beautiful, but let not the hand be stretched forth to grasp them if it would escape a wound. Wandering at Dover, towards the east, over shingle and among fallen masses of chalk, the sea-heath, that pretty, delicate, and red flower, with its small purplish red blossoms, may be seen and gathered; as it may be, if the walk is westward as far as Archcliff fort. The wild madder, too, nearly related to the dyer's madder, may be found to the east of the caves, as well as at Lydden Spout.

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* Ammophila arundinacea. † Elymus arenarius.
‡ Carex arenaria. § Calamagrostis arenaria.
‖ Plantago arenaria.

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* Genista scoparia. † Pinus maritima.

Of one plant, well-known on the English, Scotch, and Irish coasts, a poet says:—

> "The eryngo here
> Sits as a queen among the scanty tribes
> Of vegetable race. Around her neck
> A gorgeous ruff of leaves, with snowy points,
> Averts all rough intrusion. On her brow
> She binds a crown of amethystine hue,
> Bristling with spicula, thick interwove
> With clustering florets, whose light anthers dance
> In the fresh breeze like tiny topaz gems."

This plant,* called by various names, and among them the sea-holly, and the sea-holme, has a stem about a foot in height, much branched, with prickly leaves, and dense heads of blue flowers, like those of the wild thistle. Its roots were formerly candied, and sold as a sweetmeat by confectioners. An apothecary at Colchester, named Buxton, who thought highly of its medicinal properties, is said to have first prepared it in this way, some two centuries ago; and an establishment for their preparation existed not long ago in that town, and may perhaps be found there still. This plant is only to be found in the sand, and has a large, veined, prickly leaf, much like that of the shrub or tree which has so often excited the admiring gaze.

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* Eryngium maritimum.

There is a flower

> "which rustic neatness leads
> Round the trim garden's walks and beds,
> Whose globe-like tufts of blossom throw
> O'er the green marsh a rosy glow."

It is the common thrift,* found not only on the tops of mountains, but on the muddy sea-shore. All the leaves come from the root, which is tufted and fibrous. The flowers, called by the children "pin-cushions," are pink, collected in a round head, and partly enclosed in a scaly cup, that ends below in a brown dry sheath, running some way down the flower stalk.

The sea-lavender,† having flowers with a branched, spreading head, is a handsome plant, common on our muddy sea-shores; flowering in July, and growing to the height of eight or ten inches. Its colours are of a fine blue. The flowers and flower-stalks retain almost all their colour and beauty when dried; they are often gathered for winter nosegays, and are used by bird-stuffers to ornament the cases of animals. This plant, though its name might suggest the contrary, has no scent.

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* Statice armeria. † Statice limonium.

One of the prettiest flowers is the sea-side convolvulus.* Here, too, is the little burnet-rose,† bearing cream-coloured flowers; the dwarf-fruited rose;‡ and the small white petals of the sea-side pimpernel.§

> "Among the loose and arid sands,
> The humble arenaria creeps,
> Slowly the purple star expands,
> But soon within its calyx sleeps."

This may be proved to be the fact by the careful observer. The purple sandwort‖ has numerous stems lying on the ground; leaves fleshy, awl-shaped, and tipped with a white hair, and flowers of a beautiful pink, opening only when the sun shines, and closing up in the evening, or before a shower. Its waking hours extend from about nine in the morning till three in the afternoon.

The tamarisk, or sea-cypress,** waving with the wind in most graceful undulations, with its beaded flower-buds, its light feathery blossoms, its lovely verdant hue, and its rich red stems and branches, may well attract attention. It has been described as forming the ornament of Sandgate, flourishing on its sandy banks, and flowering there twice within the year. It may also be observed at Dover, and in other parts of the country.

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* Convulvulus soldanella.

† Rosa spinosissima. ‡ Rosa rubella. § Arenaria peploides.

‖ Arenaria rubra. ** Tamarix Gallica.

Where the salt marsh meets the sand, other plants appear; as the salt marsh club-rush,* and the glasswort;† while the little sea-milkwort‡ may sometimes be observed, with its thick leaves and small pink clusters; and the tripoly star, § or tall Michaelmas daisy which has lilac clusters of starry blossoms, and juicy pale-green leaves and stems. On the muddy shore below white flowers may be gathered; they are those of the scurvy-grass,|| whose juicy leaves yield, it is said, a refreshment to the invalid.

On many banks near the sea the furze** is plentiful, bearing well the rush of the winds, and uninjured when the salt spray dashes over it. It is said always to contain salt, so that it is agreeable and nutritious to cattle, and prevents and remedies some of their maladies. It used to be collected for burning lime, but is less so now, coals being brought so much more within reach. Here and there a peasant boy or girl may still be seen gathering it to kindle or increase a fire; for it burns rapidly, and diffuses a considerable amount of heat.

At other useful plants we can only just glance: as the broad-leaved pepperwort.†† To promise a saint yearly a pound of it, when pepper was dear, was once considered a liberal bequest. Its leaves, too, were employed to season many a dish; and hence it is still called "poor man's pepper." Nor let the eye turn displeased from a plant of which Milton said:—

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* Scirpus maritimus. † Salicomea herbacea. ‡ Glaux maritima.
§ Aster tripolium. || Cochlearia officinalis.
** Ulex Europæus. †† Lepidium latifolium.

> "When from the boughs a savoury odour blown,
> Grateful to appetite, more pleased my sense
> Than smell of sweetest fennel."

The sea-beet,* a native of the sea-shore of England and the south of Scotland, has a root which is thick, tapering, and white when cut across; its stem is branched and two feet high; and its flowers, single, or two together, in leafy compound spikes, are of a pale green colour. This plant, which frequently grows in great abundance on the sea-beach, the salt marshes, and all about the cliffs, is very useful, and is as good as the cultivated spinach. As an edible vegetable it is often cultivated on the coast of Cork.

But, most remarkable of all, is the sea or cliff cabbage. In May and June its flowers may be observed, of a pale yellow, but shaped like those of the wall-flower. It is the origin of our garden cabbage. Brassica, its Roman name, is supposed to have been derived from *præseco,* because it was cut off from the stalk. It was also called *caulis,* on account of the goodness of its stalks; from this the English name cole, or colewort, is obtained.

The word cabbage, now applied to all the varieties, means the firm head or ball that is formed by the leaves turning close over each other. Hence the phrases that have arisen: the cole has cabbaged; the lettuce has cabbaged; and "your tailor, working at your own house, instead of shreds, cabbages whole yards of cloth."

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* Beta maritima.

The common centaury,* readily found in dry pastures when the soil is chalky, grows about a foot high, quite upright, seldom branched, except in its flowers, which are borne on loose heads, and are of a fine pink colour, has a kindred plant, strongly resembling it, growing up the cliffs. A sea-carrot † is so much like our garden vegetable in its flowers, leaves, and root, as to be distinguishable at once. Above them, on the cliffs of Dover, during August and September, the upright spiked thrift ‡ bears its beautiful lilac flowers.

> "Then half way up the cliff, whose rugged brow
> Hangs o'er the ever-toiling surge below,
> Springs the light tamarisk, the summit bare
> Is tufted by the statice; and there,
> Crushed by the fisher, as he stands to mark
> Some distant signal or approaching bark,
> The salt-wort's starry stalks are thickly sown,
> Like humble worth, unheeded and unknown."

The prickly saltwort § is a spreading plant, with awl-shaped leaves, tipped with spines, and an angular stem with pale greenish flowers growing close down upon it.

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* Statice spathulata. † Erythræa centaurium.
‡ Daucus maritimus. § Salsola kali.

It blossoms in July, and grows very generally among the sands of the shore. This plant is pickled and eaten at table. It yields, like all of the same genus, an abundance of soda.

On the cliffs may be observed that general favourite, the yellow bedstraw,* with its abundant, clustered, and minute flowers. Its drooping leaves, its jointed stem, and round, shining, naked, smooth seeds, accord in delicacy with the golden florets. The Highlanders of Scotland use its roots instead of madder to dye woollen cloth of a red colour. The sea spurrey sandwort † may often be observed, with its green, trailing stalks hanging like tresses down the sides of the cliff; or in a less pleasing state, growing among the pebbles of the beach, beyond the reach of the waves. It is a very succulent plant; with semi-cylindrical leaves, having sharp, needle-like points, while star-shaped flowers, of a small, reddish lilac, appear between the leaf and the stem.

The cliffs contain many objects of great interest. Such is the plant called by the Italians *Herba di San Pietro*, or, St. Peter's Grass; a name reduced to sampetra, corrupted into sampier, and now usually spelt samphire. Sometimes it may be plucked by the passer-by; commonly it appears far beyond his grasp, but distinguished from other plants by its clumps of sea-green foliage, varied in the month of August by its little clustering flowers of a pale yellow hue. Shakespeare alludes to the Dover cliffs, where

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* Salium verum. † Arenaria marina.

> "———— half way down
> Hangs one that gathers samphire, dreadful trade,"

and Phillips says :—

> "———— Nor untrembling canst thou see,
> How from a craggy rock, whose prominence
> Half overshades the ocean, hardy men,
> Fearless of rending winds and dashing waves,
> Cut samphire, to excite the squeamish gust
> Of pampered luxury."

One of the London cries, now long extinct, was, " I ha' rock sampier, I ha' rock sampier." In later times it has become but little used. It has, however, a pungent and agreeable flavour, which formerly led to its being used as a salad ; and of all our wild plants it is decidedly the best for pickling; for which purpose it is still gathered and sold.

An interesting circumstance is connected with this marine plant. The visitor to Hastings will remember what a fine object is the noble promontory of Beachey Head, at the foot of which lies the pleasant village of Eastbourne. Every variety of light and shade seems to be exhibited by that elevation. Sometimes, when the morning is fine, it is so distinctly visible that every path over its summit, and even the houses at Eastbourne, may be clearly traced.

At others, it is shrouded in mist, and scarcely distinguishable from the sky above and the sea beneath ; or hiding all its form, except the one long, narrow strip of purple with which it streaks the sky ; or enveloped as with a flood of radiance, by vast masses of golden clouds, amidst which slowly sinks behind it the evening sun.

Near Beachey Head it was, that some years ago, a vessel was wrecked, and the whole crew washed overboard. Four only survived, but, as they thought, to suffer a more lingering death. Amidst the howling of the storm, the thick darkness of the night, and the violent dashings of the waves, they were cast on the breakers, but found that when they had climbed the highest of these low rocks that the tide was rapidly rising, and they doubted not that when it had attained its height the entire range would be covered by the waters. Unable to see any object beyond the spot on which they actually stood, and chased by the infuriated waves, which at length dashed upon them, all hope of life expired, and they debated for a moment whether they should not throw themselves on the mercy of the waters in the deep agony of their despair. Just at that crisis, one of them grasping a plant to hold himself more firmly to the rock, saw, as a lightning-flash lit it up for a moment, that it was the samphire; and he recollected that this plant never grows under water.

It became to him and his companions the messenger of mercy and of hope; they felt that here a limit was set which should not be passed; they cheered one another to wait for the morning light; and soon after it dawned they were seen from the cliffs, and conveyed unharmed to the shore.

In many countries rounded and angular boulders of great size are very abundant, either embedded in the sands or spread over them. Vast areas, literally covered with them, occur in many parts of Europe:

> " Huge rocks and mounds confus'dly hurled,
> The fragments of an earlier world,"

lying exposed on the surface of the ground, as bare as when left by the retiring waters. Many of them, indeed, might more properly be termed rocks, being from twenty to forty feet high, and weighing many hundred tons. Though in England there are no tracts covered with boulders of such magnitude, yet the same phenomena are observable on a smaller scale in various districts. Boulders of the granites, porphyries, syenites, and slatey rocks of the Cumberland mountains are dispersed northward towards Carlisle; south, towards Morecombe Bay; and east, to the foot of the Pennine chain. They may be traced from Lancaster at intervals through the comparatively low country of Preston and Manchester, lying between the sea and the Yorkshire and Derbyshire hills, to the valley of the Trent, the plains of Cheshire and Staffordshire, and the vale of the Severn, where they occur of considerable magnitude.

The shingly sea-beach is formed of rounded and water-worn pebbles of various sizes; it slopes very gently towards the ocean; it occurs on a flat coast and also between the cliffs and the sea, and it is wasted, more or less, by every tide. Now, however strange, it is still true, that the shingly beach has a general eastward movement along the south coast of England—that is, from Cornwall onwards towards Kent. The currents and tides which flow in from the Atlantic drive this shingly before them and heap it up on the shore, where it is gradually shifted along from west to east.

These pebbles consist of fragments broken from off the cliffs or brought down by the rivers, and which have become rounded by the action of the water. The more they are worn the smaller they become, and hence arise all their varieties from grains of sand to large stones. Sometimes the shingle merely lies along the coast, forming the well-known "beach" of our southern watering places; while in other parts, through the contour of the coast, or the action of particular currents, they become grouped in enormous masses. Thus the western end of the channel which divides the Isle of Wight from Hampshire, called the Solent, is crossed for more than two-thirds of its width by the shingle-bank of Hurst Castle, which is about seventy yards broad by twelve feet high, presenting an inclined plane to the west. This bank consists of rounded chalk-flints, resting on a sub-marine clayey base. The flints and pebbles are derived from the waste of the Hordwell cliffs to the westward. Newton Poppleford, or Peppleford, in the county of Devon, is so called from the oval pebbles found in its soil.

Proceeding from Weymouth to Portland by Sandsfoot Castle and Smallmouth Sands—which derive their name from the mouth of the narrow channel of that part of the coast of Dorset, a remarkable object may be observed—the Chesil Bank. The pebbles by which it is covered to the depth of four, five, and six feet, called Portland pebbles, are chiefly of a white calcareous spar, but partly of quartz, chert, jasper, and other substances, yet so loose that it is toilsome to traverse them, and the legs of a horse sink at every step almost knee-deep. The Bank slopes on one side towards the open sea, and on the other, towards the narrow inlet of the Fleet. It rises gradually towards Portland, being there composed of pebbles as large as swan's eggs; but in its course along the coast the stones gradually diminish in size; at Abbotsbury they are about the size of horse beans, and more westward they degenerate into mere sand. The smugglers who used to land there at night were thus furnished with a natural guage, by which they could tell whether they were near to Portland, or on the coast. This curious ridge is continually shifting; a north-east wind sometimes clears away the pebbles in parts, leaving the blue clay exposed, but the bare spaces are soon covered again by the heavy sea which the south-west wind drives against the Bank. At the north-west extremity of the Chesil Bank there was once a "Swannery," consisting of many thousand swans. Wild swans still build in the neighbouring swamps; and the Fleet is much frequented by different kinds of water-fowl.

Supposing the shingle to be lying along the shore, the first movement to which it is subjected is to be driven obliquely forward, rather up the shore and somewhat to the east. Every breaker is seen to drive before it the loose materials with which it meets; these are thrown up on the inclined part of the shore on which they rest, and in a direction corresponding generally with that of the breaker. Most of the winds on the southern coast come from the south-west, and the waves thus generated throw up the shingle in a north-east direction. In most cases the finer particles descend the whole distance with the returning breaker, unless resting accidentally in some interstices; but the larger pebbles return only a part of the distance; the distance to which each pebble returns bearing some relation to its dimensions. In others instances, depending on the wind, pebbles of every size return with the breakers which forced them upon the beach. These are accompanied also by others which had been previously deposited, but which are, in some instances, disturbed by the waves; and by the continued action of the breakers in this manner, the whole of the shingle previously accumulated is immersed below the surface of the water.

The heaps of shingle on a beach are either accumulated or destroyed according to the rapidity with which the waves or breakers succeed each other. When less than eight breakers follow in a minute, the accumulative action goes on; but when there are ten in a minute, the waves wash away those which had been previously accumulated. Thus, although these rapid waves become dispersed and broken in the same way as the slower ones, yet they follow so rapidly that each wave rides over its predecessor while on its return, producing a continual downward current and carrying with it the pebbles which were disturbed. A rapid succession of waves for five successive tides washed away large heaps of shingle which had accumulated near Folkestone; whilst the next four tides, less violent as to the rapidity of the waves, restored the accumulations. Similar facts were observed at Dover and Sandgate.

If a wall or a pier be extended from the shore into the sea, its first effect is to impede and prevent the progressive movement. The shingle therefore accumulates against the pier until the angle formed by the pier and the line of the shore is occupied. The pier being now no longer an impediment, the motion is again restored, and the waves proceed as before. Such was precisely the case at the harbour of Folkestone in former and in later years.

On the shingly beach, and among rocks never washed by the waves, where the wind has driven many sea-weeds of various tints, bronzed masses of "potatoe-stones," as the Dover people call them, may be frequently picked up. They are, in fact, specimens of pyrites; a sulphuret of iron, an abundant natural production of a brass-yellow colour. The name is derived from the Greek word for fire; probably from these substances being hard enough to strike fire with steel. Crystallisations of great beauty are sometimes found in the half-hollow stones of the shingle. The small brown pebbles, called coproliths, may often be observed. They contain, on analysis, a large portion of phosphate of lime. Extremely useful as manure, they are sought for by landed proprietors. A common locality of these pebbles is the red crag of Suffolk; and those who visit Ipswich, Woodbridge, and their neighbouring coasts, may find them in abundance.

Amber may sometimes be picked up on our shores, particularly after a storm. Sophocles described this substance as the congealed tears of the lady gulls, Meleagridæ—sisters in the days of his flesh to Meleager, but after his death metamorphosed while washing into the sea-mews, who have ever since, according to this fable, been shedding tears of amber. Hill says, on the other hand, that the earth is its true parent, and that when found strewn about the shingles, it has been first separated by the waves from the cliff, and then returned by the sea to the shore. In confirmation of this he states that amber is found in digging in Prussia and other places, with a natural mineral crust upon it, and consequently called "rock-amber;" while that which is found on the beach is without this crust, and called "smooth amber."

Attrition shapes the clear, transparent pebbles, having veins and bands, which in some specimens are as clear as crystal, and in others of a bright yellow amber, dark-brown, and blueish-black colour. Small pebbles of pure transparent quality are found in the shingle of many parts of the coast, as in Compton and Sandown bays, in the Isle of Wight, probably washed out of the Wealden strata. Shingle contains other siliceous pebbles, which essentially differ from those of the chalk flints. Some are composed of a dark-brown mottled jasper, veined with black arborescent figures, or marked with zones of rich bronze tints. Some have a concentric arrangement of bands of flint of various shades of colour, and resemble agates; while others assume the character of chalcedony. Some of these were probably derived from veins or masses of flint in strata now destroyed. The jasper was long esteemed as having a medicinal power. Cardan affirms that whether taken in potions, or worn simply round the neck, it will "increase wisdom, and expel vain fears. I have cured," he adds, "many madmen with them, who, when they laid aside the use of these stones, became as mad as ever they were at first." Such was the superstition of former days. "Agates," says Pliny, "not only imitate mosses and bee-hives, but in many places they have flowers imprinted upon them, like to those which grow by the highway, and paths, and fields; and they also assume many yet stranger appearances." Thus we have seen them bearing a considerable resemblance to a human face.

On the northern coast, the bituminous carbon, called jet, may sometimes be picked up. Scarborough and Whitby have each been remarkable for a manufactory of this substance. At Whitby it is found in large blocks, which are cut afterwards at Scarborough into every species of personal ornament. This substance was highly esteemed in ancient times. Millin mentions a black cat's head in jet, to be seen in the Cabinet Royale at Paris, and a human head, engraved in the same material, as two genuine antiques.

Cornelian Bay is a favourite resort of visitors. It lies to the south of Scarborough, and is situated at about two miles distance along the coast. When the weather is fine, and the tide is down, numerous individuals and parties may be seen going thither in pursuit of pebbles. If a day is selected for the trip when it is high water, at seven or eight o'clock in the morning, there will be abundant time for delightful exercise, and for obtaining these little gems. Cornelian is a species of quartz-agate, always of one only, but not always of the same colour, though it may be flecked with white, cloudy or clear, semi-transparent, of a fine compact grain, varying in hardness, and exhibiting when broken a fracture almost glassy in appearance. Not only may true cornelians be found here, as the writer can attest from more than one experience, but moss-agates and jaspers—the latter being especially plentiful. A return may be made the same way; or parties may climb the cliff by which the bay is curtained, and proceed to Scarborough, by the Bridlington Road, to try, if they please, Pliny's celebrated recipe:—"Of cloudy cornelians as many as you may happen to have, and of Corsican honey as much as will cover them; stew over a slow fire, till the acrimony of the honey has penetrated into the stones; then take them out, wipe and sell them for Orientals, as nobody will know the difference!" Certainly imposition is far from being extinct. The emeralds and aqua-marines which look so gay in some of the shops where "curiosities" are exhibited, are often nothing more than water-worn fragments of common green glass bottles; while the moss-agates, jaspers, and other stones said to be obtained on our own coasts, are frequently importations from some foreign shore. The great supply of cornelians is from Japan, where they are found in vast quantities, and they are also collected largely in the province of Guzzerat, and are imported from Bombay. Niebuhr says the best come from Cambay. Many of the antique gems are engraved in cornelian; and it has long been used for seals, to which it is well adapted.

But what is this pebble that lies at our feet? Let us pick it up and examine it carefully. It is manifestly a *flint* pebble—a fragment of a larger mass; and it has been no less clearly transported from a distance, for its surface is smooth and rounded. Here, then, we see its relation to the chalk rock, of which it once formed a part, and its relation to the sea, which wore away its angles by friction against other pebbles. Even now the tide is coming up, driving onwards the loose stones on the beach, which rattle back as the wave retires, thus illustrating the very process through which it has passed. The incessant dashing of the waves against the base of the chalk cliffs undermines the strata; hence huge masses of rock are constantly giving way, and falling into the waters, of which the visitor to Dover has ample evidence. As the chalk is softened and disintegrated, it quickly becomes round, and, transported to the depths of the ocean, it forms new deposits. But the flints thus detached are broken, and rolled by attrition into the state of boulders, pebbles, and gravel, and ultimately of sand.

An interesting incident may conclude the present chapter. Some sixty years ago, a young actor at Munich so utterly failed in his performance as to be peremptorily dismissed by the enraged manager, whose comedy he had marred, if not absolutely endangered. And well might he be sad; for, to add to his disappointment, in a wretched garret lay his father's corpse; his widowed mother looked to him as her only stay; and a group of little brothers and sisters depended on him for their daily bread. With indescribable grief, therefore, and a few sorry crowns in his pocket, he left the theatre, bought food for the hungry family, and ordered a coffin for the departed. That night he watched by the side of his father's remains; in the morning he followed them to the grave; and then, wandering on the banks of the neighbouring river, thought for an instant of throwing himself in; but, shuddering at the crime to which he was tempted, he knelt down to ask forgiveness of God; and, at last, absolutely worn out, he sank down on the grass to sleep. As he awoke, with the rays of the morning sun, and amidst the merry chirping of birds, he felt refreshed and thankful that he was still alive, and now resolved to return to the city. But a pebble caught his eye; it was white, for it was a chalk-stone, and on it was an exquisite tracing of some little creature. As he brooded over it with profound attention, a thought struck him, others succeeded; experiments followed: he saw, at length, the possibility of engraving on stone, and obtaining therefrom some beautiful impressions. That young man was, in fact, Aloise Senefelder, and that white pebble was the cradle of the art of lithography.

CHAPTER IV.

CLIFFS AND CAVES.

To sit on rocks, to muse o'er flood and fell,
To slowly trace the forest's shady scene,
Where things that are not man's dominion dwell,
And mortal foot has ne'er or rarely been ;
To climb the trackless mountain all unseen,
With the wild flock that never needs a fold ;
Alone o'er steeps and foaming falls to lean ;—
This is not solitude : 'tis but to hold
Converse with Nature's charms, and view her stores unrolled.

BYRON.

Enter this cavern, stranger ! the ascent
Is long and steep, and toilsome ; here awhile,
Thou may'st repose thee from the noon-tide heat,
O'er canopied by this arched rock that strikes
A grateful coolness. Gaze, O stranger, here !
And let this softened heart intensely feel
How good, how lovely Nature ! SOUTHEY.

ROCKS, STRATIFIED AND UNSTRATIFIED — THE UNDER-CLIFF — CHALK CLIFFS OF KENT—ALUM BAY—ENGLAND ONCE PHYSICALLY UNITED WITH FRANCE—ENCROACHMENT OF THE SEA ON THE LAND — HOB-HOLE, NEAR WHITBY—CAVE AT FLAMBOROUGH HEAD—ARCHED ROCK AT FRESHWATER—THE NEEDLES—PILLARS ON THE YORKSHIRE AND DEVON COAST—CAVES IN DEVON—QUARRIES OF THE ISLE OF PORTLAND—RAVAGES OF THE SEA.

"Hard as a rock" is a popular simile, yet, strictly speaking, it is not correct. The term rock is applied scientifically to all the substances that constitute the crust of the globe, from the soft clays that lie beneath our feet, and the loose sand and gravel that yield to every step, to the granite that forms the highest Alps, or the porphyry that crowns the peaks of the Andes. Diverse, however, as the rocks appear, the chemist shows that they are resolvable into certain elementary substances; and that oxygen, which in its simple state is a light and invisible gas, is supposed to constitute at least one-half of the solid contents of the earth.

The external structure of rocks has been classed as *stratified* and *unstratified;* granite, porphyry, and serpentine being among the latter, occurring in enormous masses, only broken by irregular fissures in different directions; while the former exhibit a regular structure of layers or beds, to which the Latin word *strata* is applied. They vary from the thickness of paper to that of many yards, and are sometimes divided by a thin layer of soft earthy matter, called a seam; but at other times the surfaces of the upper and lower bed are so closely joined that they can only be separated by a considerable force.

The stratified rocks cover the largest parts of the earth's surface. They consist essentially of one or more of three kinds of matter only. These are clays, limestones, and sandstones, more or less hard. Poetry speaks of "everlasting and eternal hills;" but it is obvious that while the mountains, valleys, plains, and the interior of a country are undergoing slow but constant change by the combined power of the atmosphere and of running water, its coasts and shores are exposed to destruction from the action of the waves and the encroachments of the sea. The crumblings of different rocks yield, of course, their constituent particles; thus, sandstone crumbling, under whatever power, forms the sand we have already contemplated; when a hard clay rock crumbles, it forms a more or less tenacious clay soil; and as limestone crumbles, it forms a calcareous soil. The crumbling of rocks which consist of a mixture of these substances, gives rise to soil of intermediate qualities. These, properly speaking, are neither clayey, calcareous, nor sandy; but they form chiefly the more open, fertile, and valuable loams, which the agriculturist likes as inviting and rewarding his toils.

The Under-cliff in the Isle of Wight comprehends a small tract of country on the south-east coast, above six miles in length, and from a quarter to half a mile in breadth, extending from Dunnose to St. Catherine's Hill; and consisting of a series of terraces, formed by fragments of rock,—chalk and sandstone,—which have been detached from the cliffs above, and deposited on an under bed of blue marl. It presents in many places spots of great beauty. One of these will be traced by the footpath from Bonchurch, which leads through romantic scenery as far as Luccombe's hamlet. The cliffs rise to a noble height, and are, in many parts, beautifully mantled with ivy. The coppice woods are very rich in foliage, and not injured in the least by the sea air. The masses of fallen rock, among which the footpath winds, are of vast size, and some of beautiful forms. The springs which break out in many places at the bottom of the rocky bed, though not copious, have formed some small pools overhung with wood; and very rugged paths, probably made by cattle, lead through the thickets in various directions, and open unexpectedly on wild and striking scenery. The height of the Undercliff is greatest at its two extremities: St. Catherine's Hill being nearly 900, and St. Boniface Down 800 feet, above the level of the sea. So favoured is the climate on this part of the coast, that during the colder months of the year the myrtle, the geranium, and many other exotic plants flourish luxuriantly in the open air; even in seasons when the severity of the frost has destroyed the green-house plants on the north side of the island, though placed in sheltered apartments.

The deep cuttings in different rocks, which may be observed in railway travelling, open fine sections for the study of geology. Let us take, in illustration of this, a journey from London to Brighton, in which the rocks through which the road lies may be observed without losing the pleasure offered by the neighbouring landscapes. From the station at London-bridge to New-Cross a dark-looking mould is traversed, so well adapted to the garden-grounds which can scarcely fail to be noticed. As soon, however, as the bridge is passed, it may be seen that a high bank of clay has been cut through. At Croydon, we come to beds of gravel; but, passing the Stoat's Nest, deep cuttings in the chalk are entered. In the upper part a black line, continued on both sides for miles, is flint, while below this layer are two other lines of a dark-brown colour; they are seams of marl. Thus far variety is discoverable, but there is more beyond. Beyond Reigate there is a hill on each hand consisting of different coloured sands in successive layers. Before Horley is reached there are flats abounding with clays and sands, furnishing fuller's earth and iron ore. At Horley a perfectly new series of rocks, called the Wealden, is reached; the term having a particular reference to the districts of Kent, Surrey, Sussex, and Hampshire, known as the *Wolds*, from the German *Wald*, and signifying a wood or forest. This group, filled with shells, is passed at St. John's Common. The substance is called Sussex marble; for the weald clays combine beds of lime-stone composed of *paludinæ*, a fresh water mollusc, which gives its surface, when polished, a beautiful appearance. At Stone Poundgate, near Hurstpierpoint, the sands are again entered which were left at Reigate station. And, as soon as the sands are passed, the chalk is once more reached. What a variety of substances, then, may an observant traveller notice in a railway ride of an hour or two!

No one who visits Kent can fail to observe the extension of the great chalk deposit. Above the chalk lies a deep bed of plastic clay, and above this the London clay—of which latter the hills of the Isle of Sheppey consist, and also Shooter's Hill, which is about four hundred and forty feet in height. Near Pegwell Bay this London clay immediately covers the chalk, spreading over a tract of no great extent. In some parts, as, for example, a strip from the valley of the Darent to below Gravesend, the overlaying clays have been more or less completely washed away; the chalk being covered with a mixture of sand and vegetable soil. Of the thickness of the chalk some idea may be formed from the cliffs which abruptly crop out, and overhang the sea, or the estuary of the Thames. The hill on which Dover Castle (of great antiquity) stands is four hundred and sixty-nine feet in height; in other parts, near Dover, the cliffs are about four hundred feet high; and those of the North Foreland are from one hundred to two hundred feet. These are, of course, only the measurements of the out-cropping cliffs; but the actual thickness of the stratum of chalk itself is considerably more. Sir H. De La Beche estimates its average thickness at seven hundred feet. Dr. Conybeare considers it to range between six hundred and one thousand feet. From causes which have operated since its deposition, producing the abrasion or removal of its upper surface, and also, very probably, from original local causes influencing its deposition in different places, the thickness of the chalk is variable. The height of the cliff at Beachey Head, Sussex, which at the summit includes a portion of the flinty chalk, and goes down very nearly to the upper green sand, (the next stratum,) is only five hundred and thirty-five feet; this flinty section averages at Dover three hundred and fifty feet; taking this as an average standard, the total thickness of the chalk on the Sussex coast may be estimated at about eight hundred feet. On the other hand, at Diss, in Norfolk, the thickness of the chalk, as ascertained by boring, is but five hundred and ten feet.

It is a fact that we may well ponder that England and France were once physically united. The greatest depth of the straits between Dover and Calais is only twenty-nine fathoms. The bed throughout is composed of the same stratum of chalk-rock, while a submarine chain extending from Boulogne to Folkestone is only a few fathoms under low water. Accordingly, the wave of the mighty "ocean stream," parted on the western coast, met tide after tide on the opposite banks of the connecting peninsula or narrow tongue of land, the one portion winding round the Orkneys and rolling up the German Sea, and the other portion beating on the line of cliffs facing to the west. The softer sedimentary deposits would rapidly yield to the constantly erosive action; the harder strata of the chalk, bared and undermined, would speedily follow; and thus, in a comparatively short period, the entire mass would be carried away, and the waters rolling undisturbed, would dash, as they have long done, on the coasts of two countries.

The chalk cliffs, which obtained for Britain its ancient name of Albion, sometimes present a peculiar appearance. At Alum Bay, in the Isle of Wight, for example, the hue of the chalk on one side is strikingly contrasted by the torn forms and vivid colouring of the cliffs on the opposite side. These offer a series of points of a sort of scolloped form, and which are often quite sharp and spiry. This vast wall extends more than a quarter of a mile, and is probably near 400 feet in height; its termination is by a thin edge of bold broken outline. Deep rugged chasms divide the strata in many places, and not a vestige of vegetation appears in any part; all is wild ruin.

The tints of these cliffs are exceedingly bright and varied. Deep purplish red, dusky blue, bright ochreous yellow, grey nearly approaching to white, and absolute black succeed each other, as sharply defined as the stripes in silk. After rain, the sun, which, from about noon till its setting, in summer, illuminates them more and more, gives a brilliancy to some of these almost as resplendent as the high lights on real silk. Small vessels often lie in this bay for the purpose of carrying away chalk; and they most admirably show the size of the cliffs, under whose shade they lie diminished almost to nothing. Bottles of Alum Bay sand, in all its different hues, and sometimes ingeniously arranged, may readily be purchased in the neighbourhood as memorials of a visit.

Often might it have been said of the ocean :—

> "His gathering deep
> Coiled up its strength, and with a giant sweep,
> One mighty rush, and one appalling roar,
> Dashed all its waves resistless to the shore,
> In fury launched ; the broad and steep barrier,
> Which stayed them oft in many a stormy year,
> Stays them no more ; the raging surges broke
> O'er mound and cliff, o'er edifice and oak."

The sea encroaches on the land, first destroying portions of its margin, and then transporting the fragments to other places. The eastern coast is remarkably exposed to these effects from the double current observable in the German Ocean. When the great tidal current flows from the Atlantic towards Britain, it divides into two portions at the Land's End, one of which passes along the English Channel towards Dover, while the other goes round the west of Britain towards the Orkney and the Shetland Isles, and then bending round, flows on southward between Britain and Denmark. Here the two currents meet: one going northward from Dover Straits, the other southward from the Orkneys. So considerable is the action that thus arises, that the shore is absolutely worn away by the incessant passing and repassing of these currents.

The destructive process now described has been manifested on all the different varieties of coasts; on islands, promontories, bays, and estuaries; on bold lofty cliffs, and on low shores. The Shetlands, composed of hard rock, are exposed to very violent action from waves and currents, whereby steep cliffs are hollowed out into deep caves and lofty arches, while almost every promontory ends in a cluster of rocks, imitating the forms of columns, pinnacles, and obelisks, while huge blocks of stone are torn from their beds by the violence of the waves, and hurled along to a considerable distance. One instance has been known in which a mass of rock, eight feet long, seven wide, and five thick was rent from its bed by the waves, and carried to a distance of a hundred feet. At other times the sea has forced itself a passage through rocks of the hardest porphyry. Rocky islands have by this means become mere clusters of rocks, the last shreds of masses once continuous; and thus among the Shetland isles are to be seen isolated rocks, of most fantastic form; in one case, looking at a distance like a fleet of small vessels with spread sails; in others like pyramids, needles, huge icicles, defying as to form any minute description.

Near Whitby is the cave called Hob-hole, which some years ago had a double pillar in the middle of the entrance. It has, however, been demolished by the waves, but the cavern is still seventy feet long by twenty wide at the mouth. Groups of insulated rocks are also observable which have formed one connected mass, and have become separated into fragments of fantastic and needle-shaped form, while others have been parted from neighbouring coasts by the constant action of the waves.

Another scene reminds us of the same aggressive power. Leaving the carriage at the inn, the visitor traverses the road for a short distance, and then turns to the left. Now the eye catches the large opening in the rocks, covered with verdure ; the sky with its ever-changing clouds ; and the sea, with numberless birds, playing on its surface, dipping their wings in its waves, and then, making their descent to the vast masses of rock, overgrown with sea-weeds, and bestrewing the shore. On the right are the celebrated caves of Flamborough, for which, in particular, the visit has been made, and which a few words will sufficiently picture for our present purpose.

" Kirk Hole" is derived from a tradition that the cave once extended to the Church. " The Dove-Cote" is so-called from its being the resort of rock pigeons. The one that surpasses the rest in extent bears the name of Robert Lyths, who was driven into it by the fury of a tempest; and, having strength to ascend one of the projecting ledges, continued there until the tide receded, and was thus providentially saved. Others affirm, on the contrary, that Robert was a notorious smuggler or pirate, who brought hither his prizes for careful concealment, and only issued forth with them when opportunities were favourable. Be this as it may, the entrance is low, requiring the bowing of the head, and rather dark; but, in a few seconds, there is an ample reward for such inconveniences in the sight of a magnificent grotto, whose floor of solid rock is formed with broad steps of an easy ascent, and stones curiously variegated by the impressions and stains of marine plants at the sides. The roof is finely arched, and nearly fifty feet high in the centre. The many projecting ledges and fragments of suspended rocks give a somewhat awful appearance, the effect of which is heightened by a thought of the superincumbent mass. The noble vista formed by its eastward opening towards the sea, appears in its highest grandeur on emerging from the gloom of the entrance. Many huge masses of white insulated rocks, of a pyramidical form, disjoined from the cliffs by the action of the sea, raise their broken and irregular heads to a considerable elevation.

The arched rock in Freshwater Bay, and several masses in its vicinity, bespeak in like manner their former connection with the cliffs on shore, though now 600 feet from them, the perforation of the former having been effected by the constant lashing of the ocean. The five rocks called the Needles once formed the western extremity of the Isle of Wight. The original needle or spiral rock which gave the name to the group, and which was 160 feet high, had its base undermined, and disappeared in 1764. The huge masses, sometimes called "the King and Queen," not far from Flamborough Head, had a similar origin.

Two huge detached pillars of red sandstone project from the bold headland which rises between Dawlish and Teignmouth. One of the legends of Devon is, that the one of great height, reclining against the neighbouring cliff in a position of stately dignity, its summit rounded into the resemblance of an enormous cauliflower wig, contained the soul of the ambitious Clergyman of East Devon. The other, which long stood in an attitude of humble deference, a little below the former one, incarcerated the soul of his clerk! Many affirm that they have heard the sullen moans of the one, and the nasal whine of the other, mingling their sounds with the eternal dash of the billows. A large portion of the latter was demolished in a great storm some thirty years ago, and only a relic remains. Whether that imprisons still the unhappy clerk the legends do not tell us.

High Peake, perhaps the most noted cliff on the coast of Devon, is beautiful both for shape and colour, and is the greatest ornament of Sidmouth. It slopes rapidly landward. The segment of an earthwork which probably encircled the summit at a time when the headland extended much further into the sea, may still be traced on the summit. Over its summit there is a path to Ladram Bay, where many caverns may be observed in the sandstone, and the sea rolls through an archway detached from the shore.

The southern extremity of the Slapton Sands are bounded by argillaceous slate cliffs, of a light greenish hue. From Torcross, a path leads westward along their edge, descending again to the sands at a slate quarry, opening to the beach by an archway. The traveller before long reaches the Start; a headland of a different geological formation. The ridge stretches boldly to the sea; sloping, on each side, like the roof of a house, and crowned along its entire length by fanciful crags, strangely weathered by Atlantic storms and shaggy with moss. Its different sides strikingly illustrate the influence of a stormy sea on the picturesqueness of a coast. On the west, the dark cliff, incessantly assaulted, presents a ruinous appearance; on the east, though moulded from the same material, it descends to the waves in a smooth precipice. Here the tourist has reached a point beyond which the sea is occasionally agitated by a roll from the Atlantic, the *ground swell* of the ocean rarely extending further eastward than the Start. Its name is said by Mr. Turner to be the Anglo-Saxon *Steort,* "a promontory;" but it is commonly explained as the starting point of ships outward bound from the channel.

At the distance of about nine miles along the coast are the Prawle and Salcombe. At the next headland of the Peartree, the visitor should look back at the western face of the Start. The actual cliff is not high, but, like that of the Land's End at Cornwall, it is extremely dark, and an impressive ruin. Prawle Point bounds on the east the entrance to the Salcombe Estuary, which is sheltered on the west by the more elevated and massive headland of the Bolt. These two promontories are the most southerly points of the county; and when viewed from the sea, in connexion with the inlet and the town of Salcombe, just peeping through the opening, form by far the most romantic scene on the coast. The Prawle is principally composed of gneiss rock, which on the western side is weathered like a surface of snow which has been exposed to the sun's rays. It is everywhere broken into crags, and terminated at the point by a singular archway, through which a boat might sail in calm weather.*

Some scenes are of a very different kind. Thus Mr. Gosse says in reference to Devon :—"On a coast where the sublime and the awful almost everywhere are characteristic, where the scenery is generally such as the savage genius of Salvator Rosa would have revelled in, —there are some parts where these characters are more than ordinarily prominent. The beach stretching away from the Tunnels on either hand, but especially that to the westward, is a scene which every lover of the picturesque cannot but admire. The Tunnels themselves, pierced through the solid rock, at an enormous expense of labour and money, to give access to the beach, are an object of curiosity; and the visitor, as he traverses these long sepulchral corridors, finds in their chilliness and darkness a not inappropriate prelude to the wild shore below. In one place the excavation of the tunnel has broken into the roof of Crewkhorne cavern; and the visitor, as he walks across a bridge of logs, passes over a gloomy den, which tradition affirms, perhaps without much foundation, to have afforded a temporary shelter to De Tracey, when first he sought a refuge after the assassination of Becket. Overwhelming indeed must be the terror which would impel a man to hide himself in such a place as this; for though it is a lofty cave, with an ample mouth, the interior is frightfully desolate; the sea closes the entrance at every tide, and at springs must wash up almost, if not quite, to the very extremity.

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* Murray's Devon.

"The Ladies' Bathing Pool, a lake partly natural, and partly artificial, and the beaches and coves where gentlemen enjoy the same luxury, are just before and around this cavern, and these spots are, during the summer, generally frequented by visitors. But I prefer to wander on towards the westward, beneath the precipitous Torrs, clambering over the huge angular spars that jut out here and there from the base of the cliff to enjoy the solitude and the magnificence. Far overhead, around the summits of the peaks, the busy and clamorous daws are flying, and the wailing cry of a gull issues now and then from some of the fissures with which the cliffs are rent. Perhaps the tide is in, and the wavelets are rippling on the shingle, or the green arching billows are dashing up with thundering roar. Perhaps the tide is out, and from the beach extends a broad area before the water's edge is reached, a wilderness of boulders and masses of rock of all forms and dimensions. As we proceed, the shore becomes more and more rugged, the strewn masses become larger, and are piled on one another in yet wilder confusion, until at length further progress is stopped by a lofty promontory that projects into the sea so far that no spring-tide leaves its base uncovered.

"Yet, if the visitor have nerve for the enterprise, he may ascend to the top of this ridge; for there is a flight of steps, very narrow, shallow, and slippery, cut in zig-zag lines up the face of the precipice, now passing over a slender archway of rock, but just wide enough for the foot, then climbing the edge of a sort of steep sloping ridge or wall by long steps, with nothing on either side but the thin air, and the points of rock far below. I have ascended and descended two or three times, but never without a shuddering coldness as I came to these parts, and an emotion of thankfulness when they were passed. Yet the prospect from the summit, the ascent into still more secluded caves and bays beyond, and the exhilaration always felt at a considerable elevation, make the ascent worth the risk. Besides that, there is in most persons a sort of appetite for hazard, the excitement itself, the pleasure of daring and surmounting danger being a sufficient remuneration.

"The promontory is Tor Point, a long narrow slope of green turf, in a walk by which it is attained from above. The projection and the elevation combine to afford the beholder a wide-spread range of prospect from its height, a prospect of sublime features."

The maritime district of Lincolnshire consists chiefly of lands that lie below the level of the sea, being protected by embankments. Much of this was once a well-wooded country; it was afterwards overflowed by the sea; it has since been recovered by embankments; and the system of drainage so earnestly pursued has made the district still more worthy the name of dry land. This coast is low; but in Norfolk and Suffolk the cliffs are wearing away. At Sherringham the flag-staff of the Preventive Service was thrice moved in fifteen years, in consequence of the encroachments of the sea. The Cromer of the present day is far inland of the former, and may yet disappear. North and south of Lowestoffe the cliffs are gradually crumbling.

The cliffs of the isle of Sheppey are also wearing gradually away. The name of Herne Bay is given to a certain spot, in remembrance of a place that once existed. Very little resemblance to a bay remains, for the waves and currents have by degrees swept away the ancient headlands. A small promontory once jutted out where the present pier is built, but it is utterly gone. Reculver, between Herne Bay and Margate, was, in the time of Henry VIII., one mile distant from the sea. In 1781 there was still a considerable space intervening between the church and the sea; but the sea has swallowed up the strip of land close to the church. That edifice still remains, with its twin towers of curious shape, serving as a landmark to seamen; but it would have been destroyed before now had it not been for an artificial causeway of stones and wooden piles, reared as a barrier between it and the ocean.

On a visit to the Isle of Portland, already alluded to, the steep road from Fortune's Well to the western cliff commands fair views of the Chesil Bank, and the low but picturesque shores of western Dorsetshire; and from the top, in a clear day, Torbay, on the coast of Devon, may be distinguished. On gaining the summit, the road runs to the right, on the extreme edge of the cliffs, from which a number of smaller roads, recurring at every hundred yards, run between lofty gullies on the face of the rocks, which rise about twenty feet above the main road.

If the visitor takes any one of these bye-paths, it will lead through a series of well-stacked piles of sandstone, into a stone-pit of irregular form, measuring, perhaps, 200 feet or more each way, and shut in by solid walls of variously-stratified stone to the height of about sixty feet. The scene is now not only remarkable, but beautiful: blocks of stone, as large as good-sized rooms, lie tumbled about in picturesque confusion, white, but intermingled with shades of yellow, grey, and red; while enormous stalactites, of orange hue, called by the quarry-men "congealed water," are suspended from the projecting rocks. Various decaying mosses and lichens, steeped in little rills strongly impregnated with iron, give their mellowing hues to the singular yet striking picture. Strange cries of "*High, high, high, boys, high,*" fall meanwhile on the ear, and may awaken no little astonishment. They are the shouts of the quarry-men, who having split the stone by means of gunpowder, need only rollers and double-handed jacks to remove the masses, some of which weigh upwards of fifty tons; and now heaving round the winches, send forth the shrill cry, which is repeated with great rapidity. The peninsula of Portland is, however, wasting away. Several instances are recorded of the disappearance of cliffs. On one occasion, the road was observed to crack early in the morning, before two o'clock it had sunk several feet, and was in one continual motion, but the only noise was that occasioned by the separation of roots and branches, and now and then of a falling rock. At night it seemed to stop a little, but soon moved again; and before morning the ground, from the top of the cliff to the water side, extending about a mile and a quarter from north to south, and 600 yards from east to west, had sunk in some places fifty feet perpendicular.

But, not to multiply instances of the same kind, at Dover, Folkestone, and Hythe, the same power may be observed in action. The whole coast of Sussex has suffered encroachments from time immemorial. In the reign of Elizabeth, Brighton was situated on that tract where the chain-pier now extends into the sea, being, in fact, situated on the beach under the cliffs, from which site all the houses, one by one, were washed away.

The cliffs from Brighton to Rottingdean show that the relative level of the land and the sea has undergone great changes within a comparatively recent period. The cliffs from New Shoreham to Rottingdean are composed of layers of chalk rubble, with flints slightly rolled, with clay and loam interspersed; the whole being an accumulation of water-worn materials, deposited at a very remote period in an estuary or bay of the sea. The base of the cliffs, to the height of a few feet, consists of the chalk strata, which may be seen at low water extending far into the sea, being covered here and there with shingle and sand. Between the chalk and the mass above described, is a bed of rolled chalk, flints, pebbles, and sand, with boulders of granite, porphyry, and other rocks, foreign to the south-east of England. It is, in fact, a sea-beach formed in the same manner as the present bed of shingles which skirts the base of the cliffs. Among its pebbles are rolled masses of chalk and limestone, full of perforations by boring shells. These strata, which must have been deposited beneath the waves, now constitute a line of lofty cliffs extending for miles along the sea coast.

It is thus manifest that the earth as it now is, might easily be destroyed by the fiat of the Almighty. But a sign has been set in the heavens that so it shall not be. If, therefore, the ravages of the sea are going on, there will be a point at which they will cease. A limit has been set to them by the ocean's Creator.

> "Oh! I shall not forget, till memory depart,
> When first I beheld it, the glow of my heart;
> The wonder, the awe, the delight that stole o'er me,
> When its billowy boundlessness open'd before me!

"As I stood on its margin, or roamed on its strand,
I felt new emotions within me expand—
Of glory and grandeur, unknown till that hour,
And my spirit was mute in the presence of Power.

"Oh what is his greatness, whose might and whose will,
First gave thee existence and governs thee still;
By the force of whose 'Fiat' the waters were made,
By the strength of whose arm thy proud billows are stayed!"

CHAPTER V.

SEA-WEEDS, CORALLINES, ANEMONES, AND CORALS.

The floor is of sand like the mountain drift,
And the pearl-shells spangle the flinty snow;
From coral rocks the sea-plants lift
Their boughs, where the tides and billows flow;
The water is calm and still below,
For the winds and waves are absent there;
And the sands are as bright as the stars that glow
In the motionless fields of upper air.
There with its waving blade of green,
The sea-flag streams through the silent water;
And the crimson leaf of the dulse is seen
To blush, like a banner bathed in slaughter:
There, with a slight and easy motion,
The fan-coral sweeps through the clear deep sea;
And the yellow and scarlet tufts of ocean
Are bending like corn on the upland lea;
And life, in rare and beautiful forms,
Is sporting amidst those bowers of stone,
And is safe, when the wrathful spirit of storms
Has made the top of the waves his own.

Perceval.

SEA-WEEDS—THEIR VARIOUS KINDS—THEIR USES—CORALLINES—THEIR REMARKABLE STRUCTURE—THEIR POLYPS—SEA ANEMONES—BEAUTIFUL SPECTACLE—THE CORAL-GROVE—RED CORAL—CORAL REEFS AND ISLANDS.

What is that floating in the little pool of a sea-worn stone, from which the tide has just retired? It is a living sea-weed. Let us take it carefully from its dwelling-place; it will repay an attentive examination.

With Dr. Johnson for our guide, we should come indeed to a different conclusion. He describes sea-weeds as plants "noxious and useless." Even so recently as about fifty years ago, a student showed his professor of botany what he considered some beautiful specimens, when the man of science looked at them cursorily, and more attentively by the aid of his spectacles, but speedily pushed them away, with the exclamation, "Pooh! a parcel of sea-weeds, Sir; a parcel of sea-weeds!"

Appealing from all such summary, not to say ignorant decisions, we remark that the plants called sea-weeds, as their name implies, either grow in the ocean, or in places where at least occasionally they are moistened by its spray, washed by its waters, or covered by its tides. Unlike land plants, they have no continuous vessels. Put a portion of one of them into the water and it will remain fresh; while the part exposed to the air will wither and die. The same effect will follow if a piece of dry sea-weed be plunged partially in water.

The fronds, as the leaves of these plants are called, differ not only in form, but substance. They vary from the toughness of leather to the consistency of jelly; and from the solid elasticity of India rubber to the filminess of silk. The depths of the ocean are shadowed with submarine groves, often of vast extent, intermixed, as it were, with meadows of the most lively hues; while the trunks of the larger species, like the giant trees of the tropics, are laden with innumerable minute kinds, as fine as the spider's thread, or transparent as a membrane. The bladders on some sea-weeds often attract attention; and their explosion when thrown into the fire has caused many a start and a laugh. These vesicles give buoyancy to the plants; when they are cut off, the weeds cease to float. Some of them are of prodigious length.

If you pick up a sea-weed that is green, it may be supposed to have grown in shallow water; the olive finds a deeper bed; and the red one still more so; so it is generally, but some exceptions to the rule have been discovered. The shades of these colours are absolutely innumerable.

Of the extraordinarily rapid growth of sea-weed the following is one of many instances:—A stone beacon, about twenty feet broad and sixty long, was about to be erected on a low rock, near the entrance of the Frith of Forth; and before any operations commenced, it was covered with dark masses of sea-weed, only left uncovered at the lowest ebb of spring-tides. On a great part of the foundation being levelled it was thought necessary to relinquish the project, when the sea-weeds had been cut away, and the roots were trampled down by the workmen. Not long after the work was resumed, when great was the surprise of the engineer on finding that the surface of the rock was again dark with sea-weeds, whose leaves, some two and others six feet in length, were waving to and fro in the waters. All of them had grown from seed; for the hard surface had previously been cleared by the pick and the chisel.

Is it asked, on what do sea-weeds feed? Partly, doubtless, on the substance of the rocks to which they are attached. If not, why do they prefer one rock to another; growing more luxuriantly on the one which they like best? "Limestone," says Dr. Landsborough, "seems a great favourite with them, and the abundance of limestone rock on many parts of the Irish coast is probably one reason why many of the Irish specimens put to shame the English and Scottish dwarfs of the same species. It is well known that there are several species that grow on rocks and on large sea-weeds, and it is as well known that, in the same habitat, those growing on rocks and those on sea-weeds differ considerably in appearance, and this seems to be owing to different nourishment by roots, as other circumstances are the same."

The largest of our common marine plants is the olive species, called the yellow tang, or more properly the knobbed fucus.* Its thick leathery stems are often several feet in length; they are sustained in the water by their large air-vessels; and if any one of these be held in the candle, it will explode with a loud noise and extinguish the light. The commonest is the bladder fucus,* having a dark spray and vesicles in its very substance. In spring as in winter, the serrated fucus† may be readily found, showing its brown spray, with saw-like edges, but no bladders. Dr. Harvey says, if fresh specimens are collected and left till partially dry, "there will exude from the pores of the receptacle drops of a thick orange-coloured fluid, which, on being placed under a microscope, and moistened with salt water, will be found to be composed of innumerable cellules, from which will issue troops of vivacious atoms, that are no sooner liberated than these commence those singular motions which the naturalist finds it so difficult to reconcile with vegetable life. Another, but much smaller sea-weed, tough and leathery, but known by the furrow down its stems, is the channelled fucus.‡

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* Fucus nodosus.

The fibrous bladder-chain, about as thick as a swan's quill, varying from six to twelve inches, and strung as leaves are with bladders, is very frequently found on rocks, near low-water mark, as well as in the tide-pools. Others of the same kind are the heath-like bladder-chain,§ a pretty sea-weed; and the granulated bladder-chain, with its cluster of olive green knobs at the base of its branches, with an abundance of air-bladders. So fond are various creatures of it that they also may be examined when a piece of it is picked up, and placed under the microscope.

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* Fucus vesiculosus. † Fucus serratus. ‡ Fucus canaliculatus.
§ Cysosteira ericoides.

Those long strap-shaped yellowish olive sea-weeds, the sea-thongs,* are worth observing. Many cups grow together, and the thong comes out of the centre; dividing into two portions as it increases in size, then each portion becoming two, and so continuing till specimens may be found on the shore, divided again and again, often three or four yards in length.

Very abundant at Torquay, where it is found in rocks or shallow pools at half-tide level, is the peacock's tail padina.† Waving in the clear water, it resembles the expanded tail of a peacock, not only in form but in its iridescent hues. It generally grows in fan-shaped fronds, several being clustered together.

The red sea-weeds, which we have gathered in great abundance in the Isle of Wight and at Scarborough, as well as on the south coast, are often exceedingly beautiful. Many of them are as fine, and some still finer, than the threads of lace. One of them has indented leaves like those of the oak-leaf, and is often found on the tangle. Its name,‡ is derived from the distinguished botanist, the Baron B. Delessert.

The grass-green division of sea-plants may generally be known by their bright verdant tint, though a few

* Himanthalia lorla. † Padina pavonia. ‡ Delesseria Sinuosa.

have a tinge of purple. Some expand with glossy leaves, others appear on the rocks like a pile of velvet; while they wave like plumes in the sea-pools, or, in the absence of water, hold down their heads, or cluster into little spongy balls. Many of them grow on others; such is the feathery *bryopsis,* the prettiest of them all, which in the water resembles a green silky plume.

The uses of sea-weed are so many that it is difficult even to recapitulate them. Well does the agriculturist know their value, spreading them as manure over his land.

The manufacturer employs them ; so that people may be seen eagerly collecting them from day to day,—

" A race inured to toil severe,
Of manners simple, and of heart sincere ;
Sons of the rock, and nurselings of the surge,
Around the kiln their daily labours urge ;
O'er the dried weed the smoky volume coils,
And deep beneath, the precious kali boils,"

that it may be used in the making of soap, of green glass bottles, and for various other purposes. Highlanders eat some kinds of sea-weeds; and the saying is common in Stronza, "Whoever eats of the dulse of Guerdie, and drinks of the wells of Kildingie, will escape all maladies except black death." "Who'll buy dulse and tang?" was not long ago a common cry in the streets of Edinburgh; and Carrigeen Moss—a species of sea-weed—was long in high repute as particularly light and nourishing for invalids. From one of these substances it has recently been discovered that a gum may be derived, not inferior to gum arabic; and on two ounces of gum a-day an Arab will subsist, and that healthily, for six weeks. Another remarkable product is mannite; a very beautiful substance, as purely white as loaf sugar, and almost as sweet; for as the manna is dissolved in boiling alcohol, the solution as it cools deposits the mannite in flaky and circular crystals, often arranged in concentric groups.

Still further: if a small quantity of a substance easily procurable at the chemist's is burnt, what will you observe? A rich, dense vapour of a violet hue; hence its name from the Greek, and its name also from the French, *iodine;* the substance having been discovered by Courtois, a manufacturer of saltpetre in Paris; and its properties first ascertained by Gay-Lussac and Sir H. Davy. A beautiful experiment may easily be made with this substance. If you place some of it in a bottle well stopped, and then warm it by holding it to the fire, you will soon observe the rich fumes of violet; and if you then leave it to become cold, the vapour will be condensed on the inner surface of the bottle, in dendritic, or arborescent crystals, varying in their arrangement like the figures of a kaleidoscope, as often as the experiment is repeated. Starch is a characteristic test of iodine, forming with it a compound of a deep blue colour; and so delicate is this test, that a solution of starch dropped into water containing less than a 450,000th part of iodine is tinged blue by it. Iodine is an irritant poison, but in certain circumstances it is highly beneficial. How is it, for instance, that fishermen and their families are generally so healthy, and as a class remarkably exempt from scrofulous and tubercular disease? As their diet is principally fish, it must have some element not common to other kinds of food, and this is believed to be iodine; which has been distinctly traced in many fish, as well as in the shrimp, the lobster, and the crab, and no less unmistakeably in the cockle, the muscle, and the oyster. Iodine, in small quantities, and in certain combinations, is frequently administered as medicine; and it has been detected by Herberger in cod-liver oil. But, whatever are the uses of this substance, or the benefits it conveys, it should be remembered that it was first discovered at a soap manufactory, in an alkaline solution procured from sea-weeds; as iodine has been very largely procured from these marine plants to the present time.

Attached to this stem is a form of life not yet considered. You say, perhaps, "It is a sea-weed;" and certainly it bears a strong resemblance to one, but its growth, structure, and character are very different. A very minute body alighted on a stone, or shell, having however a strong liking for the latter. It was not long before it put forth a stem, and as this advanced a branch emerged from each side, and what is still more remarkable, it was covered by a series of little cups, each one having in it a little creature called a polyp. In this way life and growth continued until, as the stem heightened, there were several branches, and a proportionate number of cells and polyps. Such was the history of the little coralline—the sickle-beard. Dr. Landsborough, when dredging for marine objects in Lamlash Bay, surprised the boatmen by the eagerness with which he seized creatures of this kind. When dipping one in water, it spread out into an elegant white plume—they said, with astonishment, they did not think "there was onything sae bonnie to be got in the bay."

The great horn-wrack* is of common occurrence. It is called lemon weed, because when burnt it has the odour of that fruit; and when just taken from the ocean has frequently a scent like that of violets, or of the

CELLS OF FLUSTRA FOLIACEA, OR GREAT HORN-WRACK.

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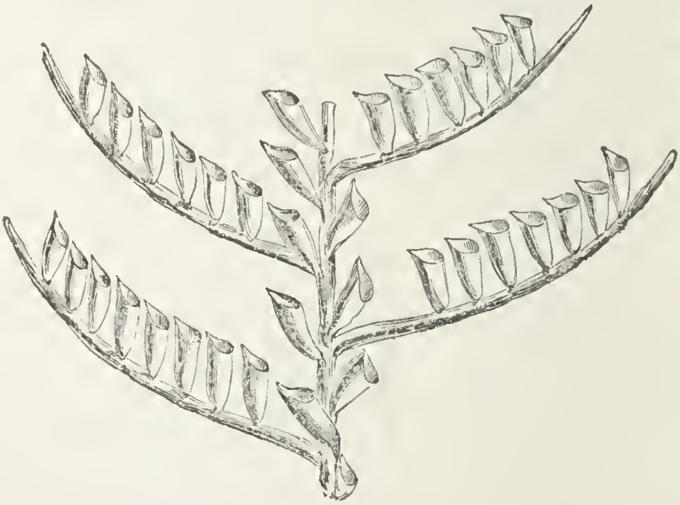
* Flustra foliacea.

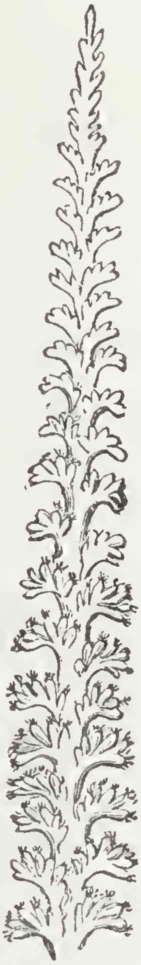
orange, but it disappears when the coralline is dried; some specimens, however, have no such odour. This coralline has cells on both sides, with elevated margins; each being armed at the upper part with two spires, which appear intended to protect the expanded polyp. The aperture of the cells is formed by a semicircular lid, convex externally and concave within, which folds down when the little tenant is about to advance from the cell. Hooke thought that it surpassed all that he had examined in "curiosity and beauty."

Another creature of this class resembles a rod in form, and hence is called *virgularia mirabilis*. Several inches in length, it is coated with a transparent flesh, and has



THE SICKLE-BEARD—(*plumaria falcata.*)

throughout its length a series of short projections, each of which is provided with a row of polyp-cells. These projections can expand considerably, so as to leave open spaces between them, or contract, so as to lie close together. The polyps residing in the cells are of great beauty.



VIRGULARIA MIRABILIS.

A very common coralline is composed of a number of tubes, each one about the size of a grass stem; all entangled at the base, twisting among each other, so that it appears like the root of a sea weed. They grow in an erect position on shells and other marine substances; and beheld in a clear, but deep rocky pool, the pink starry flowers, in great numbers, and in perpetual motion, present a beautiful spectacle. Now, if you can bring a specimen from the water, you will observe in each cell a small pink knob; and if you place the coralline in a bottle of sea-water, that knob will soon unfold a star-like polyp; clearly discernible by the naked eye, with its small tentacles or feelers moving about in all directions. The horn-coloured tuft of empty tubes, usually three or four inches high, though sometimes attaining the height of twelve inches, are common objects on the beach after stormy weather.

The Sertularia, like some other creatures of the same kind, has been found to have a curious circulation. A current of granular particles, moving like sand in an hour-glass, sets along the axis of the tube, forming portions of the stem and branches, to continue in one direction for a short time, and then immediately to return in the opposite. Sometimes the granules have a vibrating, dancing motion; in one coralline a current sets up one side of the tube, and down the other.

Corallines of a fibrous or fleshy texture are the inhabitants of a deeper water, and are never left uncovered. When, however, they are exposed, from their locality, to an unusually great agitation of the sea, they are said to have a structure proportionably dense and compact. In the intertropical latitudes they display gigantic forms, and strange or grotesque figures; in the colder latitudes they are smaller, and of firmer and more rigid texture. They often grow in places which the returning tides leave dry; but their congenial abode is in sheltered and tranquil spots, in caves and fissures of rocks, where the water, never ruffled by the storm, is "deeply, darkly, beautifully blue." Fixed, plant-like to the rock, they festoon the deep sea caves; they line the walls of submarine grottoes, and hang as grotesque ornaments from the roof; some like inverted goblets, aptly termed "Neptune's drinking cups;" some like fans, some like globes, and others like intertwined branches of fantastic growth.

A new world for examination and research opens here before us. There is an immense diversity manifest among these corallines. In some of them there is a transparent, horny cell which closely embraces the body of the polyp nearly unyielding in its lower two-thirds, but terminating above by a flexible portion which serves to protect the upper part of the body when the whole is expanded, in which state it is of the same diameter as the rest of the cell; but, when the animal retracts, is folded up and drawn in after it, and completely closes the mouth of the cell. The flexible part consists of two portions; the lower half being a simple continuation of the rest of the cell; the upper consisting of a row of delicate bristle-shaped processes, which are arranged parallel with each other round the top of the cell, and are prevented separating beyond a certain distance, by a membrane of excessive tenacity, which surrounds and connects the whole. This mode of the termination of a cell is one of constant occurrence, and is evidently a provision for allowing the freest possible motion of the upper part of the body in its expanded state, to which it affords, at the same time, support and protection.

The number of polyps on a single coralline is often absolutely astounding. In a specimen of *the crested plumularia,* there have been counted something like 24,000 inhabitants. In a coralline taken by Mr. Dana in the East Indies, this number was greatly surpassed. There were about 12,000 polyps to each plume or branch; and as the coralline, being three feet long, bore these plumes, on an average, every half inch on opposite sides, the whole number of polyps was not less than 800,000,000; a number almost equalling that of the population of our globe, yet all produced by the successive buddings of a single germ.

Lister, the naturalist, observed a singular fact in reference to a coralline. After keeping it in a large bowl for two days, he saw that the polyps drooped and looked unhealthy; and, on the third day, they were all thrown off, and lay at the bottom of the vessel, of a pink colour, which, when it had stood quietly for two days, became a very fine powder. Thinking that the cells were dead, he was about to throw them away, when, on returning home after two days absence, he found a thin, transparent film protruding from every cell. He then changed the water, and in three days every cell had produced a new polyp, differing but slightly from their former inhabitants.

Another class of marine creatures is formed of the sea-anemones. The external part consists of bundles of muscular fibres, some running perpendicularly, others transversely, and the intervening spaces between the fibres thus interlaced are numerous small granular bodies, which are universally distributed, except at the base. Over this tissue is a mucous layer, forming an epidermis or outer skin. The tentacles or arms on the upper surface are tubular, with a minute orifice at their extremities, and their interior communicates with a compartment between the stomach and the outer wall of the body; a compartment which is not single, but divided by membranous partitions into numerous chambers, between which there is a free communication. This divided cavity is the aerating apparatus; filled with the sea water, drawn in through the tentacles, and expelled when the anemone contracts, a fresh supply being absorbed on the dilation of the body, at the pleasure of the animal.

Gentle as this creature may appear, all such appearances are deceitful, for it is very voracious. It will wait even for a crab or a muscle with extended arms; only let it come within their grasp, and they instantly close around it, and by their contraction force their prey into the mouth, which has opened to engulf it. Only the soft parts of the prey, however, are retained, the shells are speedily disgorged through the mouth.

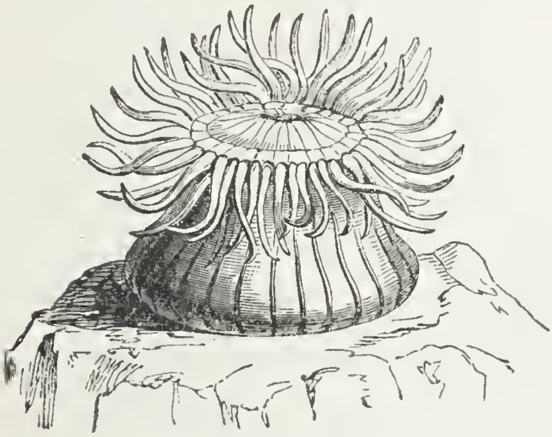
It is a curious fact that the sea-anemones, of which there is a great diversity, are like Achilles, invulnerable except in one spot. They will bear an extraordinary amount of cutting and tearing, if only the base is kept unlacerated. Exquisite little creatures, torn in two by the splitting of the stones on which they rested, have displayed each half acting as vigorously as if nothing had interfered with its integrity. In the course of some weeks not a trace was left that they had ever been wounded. The Abbé Dicquemare relates that he cut an anemone in two transversely; when the upper portion instantly expanded its tentacles and began feeding; in about two months tentacles began to grow from the cut extremity of the other portion, and thus he obtained two perfect anemones in the place of one. How marvellous is the tenacity of animal life!

The objects we have now hastily considered often combine to present to the eye a fascinating spectacle. Such a one Kingsley has described as meeting the view of the poet as he reached "that ghastly chasm across which Thurnall had been so miraculously swept on the night of his shipwreck. The same ghastly chasm, but ghastly now no longer; and as Elsley looked down, the beauty below invited him, and the coolness also; for the sun beat on the flat rock above till it scorched the feet, and dazzled the eye, and crisped up the blackening sea-weeds; while every sea-snail crept to hide itself under the bladder-tangle, and nothing dared to peep or stir save certain grains of gunpowder, which seemed to have gone mad, so merrily did they hop about upon the fast evaporating salt-pools. That wonder, indeed, Elsley stooped to examine, and drew back his hand with an 'Ugh!' and a gesture of disgust, when he found they rose, 'nasty little insects.' For Elsley held fully the poet's right to believe that all things are not very good; none, indeed, save such as suited his eclectic and fastidious taste; and to hold (on high æsthetic grounds, of course,) toads and spiders in as much abhorrence as does any boarding-school girl. However, finding some rock ledges which formed a natural ladder, down he scrambled, gingerly enough, for he was neither an active nor a courageous man. But, once down, I will do him the justice to say, that for five whole minutes he forgot all about Fra Dolcino, and, what was better, about himself also.

"The chasm may have been fifteen feet deep, and above, about half that breadth; but below, the waves had hollowed it into dark overhanging caverns. Just in front of him a huge boulder spanned the crack, and formed a natural door-way, through which he saw, like a picture set in a frame, the far-off blue sea softening into the blue sky among brown Eastern haze. Amid the haze a single ship hung motionless, like a white cloud. Nearer, a black cormorant floated sleepily along, and dived, and rose again. Nearer again, long lines of flat tide-rock, glittering and quivering in the heat, sloped gradually under the waves, till they ended

POLYP OF A CORALLINE.

in half-sunken beds of olive oar-weed, which bent their tangled stems into a hundred graceful curves, and swayed to and fro slowly and sleepily. The low swell slid whispering among their floating palms, and slipped on towards the cavern's mouth, as if asking wistfully (so Elsley fancied) when it would be time for it to return to that cool shade, and hide from all the blinding blaze outside. But when his eye was enough accustomed to the shade within, it withdrew gladly from the glaring sea and glaring tide-rocks to the walls of the chasm itself; to curved and polished sheets of stone, rich brown, with snow-white veins, on which danced for ever a dappled net-work of pale yellow light; to crusted beds of fine coralline; to caverns, in the dark crannies of which hung branching sponges and tufts of purple sea-moss; to strips of clear white sand, bestrewn with shells; to pools, each a gay flower-garden of all hues,



SEA ANEMONE.

when branching sea-weeds reflected blue light from every point, like a thousand damasked sword-blades; while among them dahlias and chrysanthemums, and many another mimic of our earth-born flowers, spread blooms of crimson, and purple, and lilac, and creamy-grey, half-buried among feathered weeds as brightly coloured as they; and strange and gaudy fishes shot across from side to side, and chased each other in and out of hidden cells.

"Within and without all was at rest; the silence was broken only by the timid whisper of the swell, and by the chime of dropping water within some unseen cave: but what a different rest! Without, all lying breathless, stupid, sun-stricken, in blinding glare; within all coolness and refreshing sleep. Without, all simple, broad, and vast; within, all various, with infinite richness of form and colour. An Hairoun Alraschid's bower, looking out upon the ocean."

This splendid specimen of word-painting reminds us of Captain Basil Hall's remarks when he was in the West Indies:—"There are few things more beautiful to look upon than the corallines, when viewed through two or three fathoms of clear, still water. It is hardly an exaggeration to assert that the colours of the rainbow are put to shame, on a bright sunny day, by what meets the view on looking into the sea in these fairy regions."

Nor less certainly do we recal Percival's verses placed as a motto at the head of this chapter, and the lines with which his piece concludes, as he describes the placidity of the waters beneath, notwithstanding the agitation of their surface by "the spirit of storms."

> "And when the ship from his fury flies,
> Where the myriad voices of ocean roar,
> When the wind-god frowns in the murky skies,
> And demons are waiting the wreck on shore;
>
> Then far below in the fearful sea,
> The purple mullet and gold-fish rove
> Where the waters murmur tranquilly
> Through the winding twigs of the coral grove."

Wellsted accordingly remarks:—"Through the bright, blue, and pellucid water, we could discern the minutest objects at an immense depth, and the secrets of the deep, thus laid open to us, afforded us the most magnificent spectacle that could be conceived, although there were neither—

> 'Wedges of gold, vast anchors, wreaths of pearls,
> Nor other treasures of the vasty deep.'"

Ehrenberg was so much struck by the corals in the Red Sea, that he exclaimed with enthusiam—"Where is the paradise of flowers that can rival in variety and beauty these living wonders of the ocean?"

Fragments of coral are familiar objects not only at the sea-side, but in all our homes. The common red kind has a beautiful branched axis, destitute of cells, covered with an animal bark, replete with granules of lime. The polyps, when expanded, resemble starry flowers, and very attractive must be the appearance of a large living branch. Each polyp has eight fringed oval arms, capable of being contracted within cells formed in the fleshy covering of the axis, which cells however, do not penetrate the axis itself.

It is of creatures apparently insignificant as polyps, that Montgomery thus speaks:—

> "Sight could not trace their evanescent changes,
> Nor comprehend their motions; till minute
> And curious observation caught the clue
> To this live labyrinth, where every one,
> By instinct taught, performed its little task,—
> To build its dwelling and its sepulchre,
> From its own essence exquisitely modell'd;
> There breed and die, and leave a progeny
> Still multiplied beyond the reach of numbers,
> To frame new cells and tombs; then breed and die,
> As all their ancestors had done, and rest
> Hermetically sealed, each on its shrine
> A statue of this temple of oblivion!
> Millions of millions, thus from age to age,
> With simplest skill, and toil unweariable,
> No moment and no movement unimproved,
> Laid line on line, on terrace terrace spread,
> To swell the heightening, brightening, gradual mount
> By marvellous structure, climbing towards the day.
> Each wrought alone, yet altogether wrought
> Unconscious, not unworthy, instruments,
> By which a hand invisible was rearing
> A new creation in the secret deep."

What a series of marvels is here! Each polyp is merely a minute pouch of animated matter, with a few feelers about its mouth, but it is so organized as to secrete calcareous particles from its food, that it may build of them a limestone house; and still more, to send forth constantly from itself germs of the same structure, and adapted to do precisely the same work. And so, slowly and silently, millions of tiny arms, the members of a compound whole, ply earnestly their task, from generation to generation, till

> "the slime was turned
> To adamant by their petrific touch.
> All
> Life's needful functions, food, exertion, rest,
> By wise economy of Providence,
> Were overruled to carry on the process,
> Which out of water brought forth solid rock."

Here sea-birds repair, and uninterrupted, save by the noise around of tempest-tossed billows, rear their broods during many a returning season. The winds drop their seeds, the waters throw them on it; they germinate; the vegetable decays; and, in due time, a rich mould is provided to cover the surface. And now the larger seeds can spring up from a genial soil; the cocoa-nut tree and the palm wave their graceful heads; and even forests arise in all their verdure and luxuriance. At length man claims it as his own, and a multitude of human beings rejoice in its abundance.

The species principally engaged in this great work is the coral, called by Linnæus the *muricated madrepore*, and generally known by the name of white coral. Vincent Rosa has given us an account of another species, that of the *fungus madrepore.* He tells us that from every cell there issues a cylindrical animal, about half an inch long and two lines in diameter, and of which the upper part or mouth is surrounded by about two-and-twenty very short tentacles. These animals, which are pendent—because this madrepore is always fixed under the projections of the rocks, and vibrates at the will of the waves—are always of a lively orange colour; they contract as soon as they are touched, and die on being taken out of the water. Whoever examines a fragment of any of the varieties of white coral will find it to consist of radiating tubes, absolutely countless, and variously intercepted, but all issuing from a common base; these are the receptacles of the polyps, while the connected individuals with their blossoms inhabit an infinity of cells opening externally, from which the tentacles issue to collect their food.

To conceive aright of the nature and structure of a coral reef, let there be imagined a great submarine mound of rock, composed of fragments of corals and shells, compacted together with a soft spongy kind of stone. The greater part of the surface of the mound is quite flat, and near the level of low water. At its edges it commonly slopes gradually down to a depth of two, three, or four fathoms, and then slopes very suddenly into deep water, twenty, or two hundred fathoms, as the case may be. The surface of the reef, when exposed, looks like a great flat of sandstone, with a few loose slabs lying about, or here and there an accumulation of dead, broken coral branches, or a bank of dazzling white sand. It is, however, chequered with holes and hollows, more or less deep, in which small living corals are growing; or has, perhaps, a large portion always covered with two or three feet of water; and here are fields of corals, either clumps of branching madrepores, or round stools and blocks of other polyps, both dead and living.

Proceeding from this central flat towards the ridge, living corals become more and more abundant; as we advance towards the windward side, we encounter the surf of the breakers long before we can reach the extreme verge of the reef; and among these breakers immense blocks are seen, often two or three yards or more in diameter, lying close on the reef. If the lee edge of the reef is approached, it will be seen covered with living corals, all glowing with rich colours, bristling with branches, or studded with great knobs and blocks. Where the slope is gentle, the great groups of living corals and intervening spaces of white sand can be still discerned through the clear water to a depth of forty or fifty feet, beyond which the water recovers its usual deep blue. A coral reef, therefore, is a mass of inert matter, living only at its outer surface, and chiefly on its lateral slopes.

One circumstance especially remarkable is: when these polyps build a circular reef in the sea, they leave an opening in this part for the entrance and the reflux of the tide, so that the waters may be constantly renewed, without which they could not continue to work, for want of their necessary food. Here is the solution of

RED CORAL.

the question often raised by voyagers, who have observed these openings without being able to detect their cause.

Nor should another be disregarded; for not only do these polyps erect their buildings in the form best calculated to resist the action of the ocean, but also breakwaters to strengthen the weakest parts, and those from which the greatest danger is to be apprehended. Thus Captain Beechey, speaking of Ducies Island, describes it as taking the shape of a truncated cone, with the face downwards, and then says: "The north-eastern and south-western extremities are furnished with points which project under water with less inclination than the sides of the island, and break the sea before it can reach the barrier to the little lagoon formed within it. It is singular that these buttresses are opposed to the only two quarters whence their structure has to apprehend danger—that in the north-east, from the constant action of the trade-wind, and that on the other extremity, from the long rolling swell from the south-west so prevalent in these latitudes; and it is worthy of observation, that the barrier which has the most powerful enemy to oppose, is carried out much farther and with less abruptness than the other."

CHAPTER VI.

SHELLS AND THEIR INMATES.

> To the natural philosopher there is no natural object that is unimportant or trifling. From the least of Nature's works he may learn the greatest lessons.
>
> SIR I. F. W. HERSCHEL.

DREDGING—THE SPONGE—THE JELLY-FISH—PHOSPHORESCENCE—THE BEROE—ASCIDIANS—ONE-SHELLED CREATURES—BIVALVES—STRUCTURE AND COLOURS OF SHELLS—MARINE WORMS—THE SEA-STAR—THE SEA-URCHIN.

PLEASANT is it to dredge, as naturalists, for a few hours at a time: to some when they forsake the shore, go forth into the deep sea, and meet with, as they will, romantic incidents, associated too with perils which may even try their nerves; to others not far from land, floating on tranquil water beneath a summer sky, with passing but gentle winds, bearing to them the lowing of cattle, the twit or song of birds, or scraps of the colloquies of field-labourers. Meanwhile, the dredge drags heavily along the bottom; though the boatman puts forth his strength, the craft seems scarcely to move; and about its inmates are bottles and vessels for the smaller fry, and just at hand a small tub, filled with salt water, for the larger specimens. So, as they follow the windings of the shore, they watch the light and fleecy clouds, with their shadows creeping over the corn which has come into ear, gaze on the ocean stretching far away to the horizon, glimpse sail after sail gleaming in the sun-light, or hear and tell tales of those who occupy the cottage, the villa, or the mansion within sight, or speculate on the produce of the next haul. And now the time has come: the oars are shipped, the boat swings round, and as the rope is slowly drawn in, how great anxiety is there to see what the dredge has brought up; aye, there it is, tangled with sea-weeds, long streamers of which trail after it through the water, and now the contents are emptied into the boat. What a spectacle meets the eye! What strange forms! What rich and varied colours! What a profusion of vegetable and animal life!

When Dr. Scoresby was sailing in the Greenland Seas, he sometimes passed through stripes of blue, green, olive-green, and transparent blue, in the short space of ten minutes. During a run of fifty leagues the sea was constantly of an olive-green colour, remarkably tinted, but on one afternoon it changed to transparent blue. So greatly did this excite his curiosity, that he determined to ascertain the cause, and discovered that the green appearance of the sea in these latitudes is caused by millions of small marine creatures. A calculation of their number in the space of two miles square, and two hundred and fifty fathoms deep, gave an amount of 23 trillions, and 888 billions. On one occasion the sea was observed to be coloured in veins and patches of a brown colour, and sometimes with a yellowish-green; and this water, on being examined by the microscope, appeared swarming with minute marine creatures. A drop of this water contained 26,500 animalcules. Hence, reckoning sixty drops to a dram, there would be a number in a gallon of water exceeding, by one-half, the population of the globe on which we live.

Another form of life may be found growing in little tufts and crests upon rocks, or lying at the roots of sea-weeds on the shore; it is a native sponge. The branched sponge, or common sort, formed of branches about the size of a goose quill, usually on a stem a little thicker and often a foot long, may often be seen among the refuse of the waves. The sponge, so familiar to everyone, is only the framework or skeleton of the living animal; the characters presented by it greatly differing in the various species, which are extremely numerous. In the living creature the canals and pores are filled with a fluid resembling the white of an egg, which varies in quantity according to the species. In some instances fibres are apparent which are horny and elastic, and seem to be tubular; in others, the framework is of greater firmness and complexity, intersected with needle-like substances, some having three or four points.

On Dr. Grant placing a small branch of a sponge on a watch-glass under the microscope, and reflecting the light of a candle through the fluid, he observed some inward motion in the opaque particles which were floating through the water. On bringing one of the apertures of the sponge fully into view, he saw, for the first time, he says "the splendid spectacle of this living fountain, giving forth from a circular cavity an impetuous torrent of liquid matter, and hurling along in rapid succession opaque masses, which it showed everywhere around. The beauty and novelty of such a scene in the animal kingdom long arrested my attention, but after twenty-five minutes of constant observation, I was obliged to withdraw my eyes from fatigue, without having seen the torrent, for one instant, change its direction or diminish in the slightest degree the rapidity of its course. I continued to watch the same orifice, at short intervals, for five hours, and sometimes observing it for a quarter of an hour at a time, but still the stream rolled on with a constant and equal velocity."

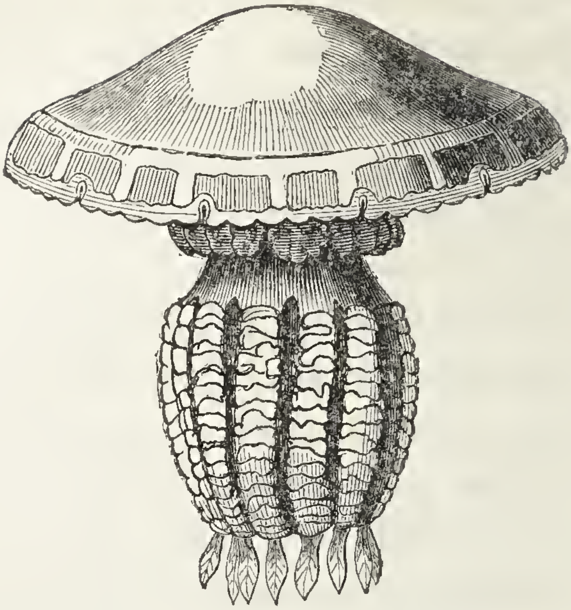
An interesting story may be told of the growth of another minute creature. A little oval body, covered with very fine hairs, swam about in the sea for some days; and then fixed itself by its smaller lower end. The opposite end now became depressed, the four corners became lengthened, and these were soon changed into tentacles, which so multiplied as to cover the upper end. Then transverse wrinkles might be observed on the body at regular distances, appearing first above and very slight, afterwards extending downwards, but all growing deeper and deeper, the edge of each one becoming serrated, or saw-like, so that the creature presents the appearance of a pine cone, surmounted by a tuft of tentacles. A separation is meanwhile going on, until the divisions resemble a pile of cups placed within each other. The upper ring is first detached, the others successively follow, and each one continues its development by itself, until it becomes a complete medusa, or jelly-fish. Thus what was at first a single individual, becomes, by minute division, a number of entirely distinct animals. Moreover, the upper segment is not developed like the rest: it is intended merely to favour their growth by securing and preparing the substances they need; and its office appears to be performed as soon as the other segments begin to be independent.

Of the jelly-fishes there is an immense variety:

> " Some in huge masses, some that you may bring
> In the small compass of a lady's ring;
> Figured by hand divine—there's not a gem
> Wrought by man's art, to be compared with them."

They consist generally, when full grown, of a large, circular, gelatinous disk, convex above, and somewhat concave on the under surface, from which the feeding organs hang pendant. Strange to say, little fishes, alarmed by the sight of an enemy, rush under this mushroom or umbrella-like form to remain until the danger is past, and then emerge again to sport and play about their sheltering friend. Fresh light is being continually thrown on the structure, varieties, and habits of the jelly-fishes, and the more we know of them the greater is our astonishment and admiration. These creatures, absolutely microscopic, as well as of larger size, contribute greatly to the phosphoresence of the ocean. At night it is as if the sea were one immense plane of glass, studded with diamonds of the first magnitude and brilliancy, or as if the luminous points with which the entire surface is literally bestowed, were sparks of fire. Sir Walter Scott thus pictures it in vivid words:—

"Awaked before the rushing prow,
The mimic fires of ocean glow,
Those lightnings of the wave;
Wild sparkles crest the broken tides,
And flashing round the vessel's sides,
With elfish lustre lave;
While far behind, their livid light
To the dark billows of the night
A gloomy splendour gave."

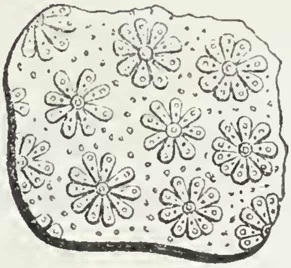


THE JELLY-FISH, OR MEDUSA.

Or, to adopt the words of Coleridge's "Ancient Mariner:"—

> "Beyond the shadow of the ship,
> I watched the water-snakes:
> They moved in tracks of shining white,
> And when they reared, the elfish light
> Fell off in hoary flakes.
>
> Within the shadow of the ship
> I watched their rich attire:
> Blue, glossy green, and velvet black;
> They coil'd and swam, and every track
> Was a flash of golden fire.
>
> O happy living things! no tongue
> Their beauty might declare;
> A spring of love gush'd from my heart,
> And I bless'd them unaware."

Spallanzani affirms that this phosphorescence is owing, in the *medusæ,* to a glutinous substance issuing from certain parts of the body. Expressed into different liquids, as into salt water, but especially into fresh water, warm, or milk, it gives to them a phosphoric light. "A single jelly-fish," he says, "thus expressed into



COMPOUND ASCIDIANS.

THE SERPULA.

twenty-seven ounces of cow's milk, rendered it so resplendent, that we might have read the character of a letter by it at the distance of three feet. The dead medusa possessed for a considerable time its phosphorescence, and it was renewed by pouring water upon it, even some time after it had ceased to shine."

Two jelly-fishes, out of an immense variety, are, according to Forbes, "the only true nettles of our British seas." One of these—the hairy cyanea—has a dingy, dark-brown disk, about a foot across; and it drags after it a great number of filaments like coarse hair. Woe to the bather who comes into contact with one, for to get out of its entangling meshes seems impossible until the creature, finding its course impeded, uncoils its hair and leaves him to himself. We have known more than one instance of great suffering from such an accident. There appears a considerable redness in the parts which have been touched, and swellings of the same colour. Dicquemare says: "After the end of some days, when the pain is gone by, the heat of the bed will cause the blisters of the skin to re-appear."

Another singular fact should not be omitted. If a common jelly-fish be taken from the sea or the shore in some vessel and carried home, and if it be looked for a few hours after, it will be gone; all that remains will be water, not distinguishable by the chemist from sea-water, except a small piece of membrane. Yet these, with *life,* formed a medusa—a creature gifted with many powers.

Now and then an animal may be taken from the waters, or found left on the shore by the waves, of a spherical form, with several ridges length-wise, and almost as transparent as crystal. Injure it, and it also immediately dissolves. It is the beroe, of which we may know more if we will examine it attentively. These ridges, so easily discernible, support as many rows of broad transparent paddles, all instinct with life. "Those paddle-wheels," says Professor T. R. Jones, "are more perfect far than ever were contrived by human ingenuity, for all the cumbrous enginery required by man to urge his movements is not needed, each float, self-moving, keeping time with all the rest." Millions of these little things, scarcely distinguishable during the day from the water in which they live, except by their bright rainbow hues, appear at night like globes of fire rolling on its surface.

But let us look around for other objects. There is an apparently lifeless lump, commonly called a sea-squirt; yet it is an ascidian, a creature well adapted to the circumstances in which it is found. Of these marine animals there is a great variety, arrayed, too, in diverse hues. Turning up some of the loose stones at the edges of the pools at low tide, there are other creatures, looking like stars of silver, yet tinted with diverse hues.

Placed in a vessel of sea-water the only signs of life may be a slight pouting-out of tube-like membranes around openings which become visible on their surface. But employ the microscope, and you will see currents in the waters around those apertures, streams ejected and whirlpools rushing in. We have not seen, in such a case, a single ascidian, but actually a commonwealth; each star is a family, each group of stars is a community. "Few bodies," it has been said, "among the lower forms of life exhibit such exquisite kaleidoscopic figures as those which are displayed in the construction of the compound ascidians."

The animals which inhabit and form shells derive their name* from the softness of their bodies; most of them being entirely destitute of bones. Some, however, are provided with internal shells, more or less perfect; and the cuttle-fish has a support in the form of a pen. Shells, therefore, are generally necessary as a defence and comfort to the in-dweller. An example may be easily obtained of the formation of shell. Remove a portion of the shell of a living snail, which can be done without the slightest injury to the animal, since it adheres to the flesh only at one point, and in the course of twenty-four hours a fine substance, resembling a spider's web, will be seen stretched across the vacant space. This is the first layer of a new piece of shell to repair the injury.

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* Mollusca.

In a few days this will be thickened by particles of a hard substance; until, in about ten or twelve days, the new portion will be of nearly the same thickness as the rest. The cobweb-like membrane and the calcareous matter are supplied from the outer covering of the animal, called *the mantle.*

All molluscs have the usual organs needed for the support of life; a heart with its veins and arteries, through which flows a white or bluish blood; an apparatus for breathing, somewhat like the gills of fish; a liver for aiding in the digestion of food; and, in some instances, a nervous system. Numbers of these reside in the sea, and are unable to live out of salt water; some continue near the surface, others can move through the deep waters, while many attach themselves by different means to the rocks beneath. In all cases, however, when they move about, they resemble the snail with which we are all familiar, bearing hither and thither their houses on their backs, and retreating into them entirely when they are so disposed.

The structure of the mollusc is always well adapted to the circumstances in which it is to live. Sometimes the mouth is a kind of proboscis, provided with little hooks, so that the creatures can pierce the shells of their prey, and extract the contents through the little round hole, which is often observable. Others, feeding on plants only, have a curious ribbon-like tongue, arrayed with flinty teeth, and often having, on each side, three rows of hooks. All the young are produced from eggs, in the same way as birds; but many, so far from abandoning them at once, keep them for a time between the two membranes of the gills, that they may pass through a kind of incubation.

The simplest form of shell is that of the limpet; the tongue of the inhabitant exhibiting, beneath the microscope, a very remarkable structure. When the mantle of the creature is more active on one side of the opening than the other, a spiral shell is produced, of which the false wentletrap, a frequent shell of our coast, is an example. The ribs are somewhat thick and smooth, and sometimes they are marked with purple spots, while the whole shell has occasionally a pinkish purple tinge. Of the wentletrap more than eighty species are now known. The royal-staircase wentletrap was once so rare that a fine specimen was sold in England for £20 or £30, and in France for a hundred louis; but now it is common, and a few shillings will secure its purchase. It is curious to observe that in these spiral shells, the whorls, as the successive ridges are called, almost always turn to the right, from the left side, where the heart and blood-vessels are placed, being the most active. In a few instances, the heart being situated on the right side, the whorls are turned to the left. Some of these spiral shells have a door nicely adjusted to the little dwelling, more or less resembling that of the snail.

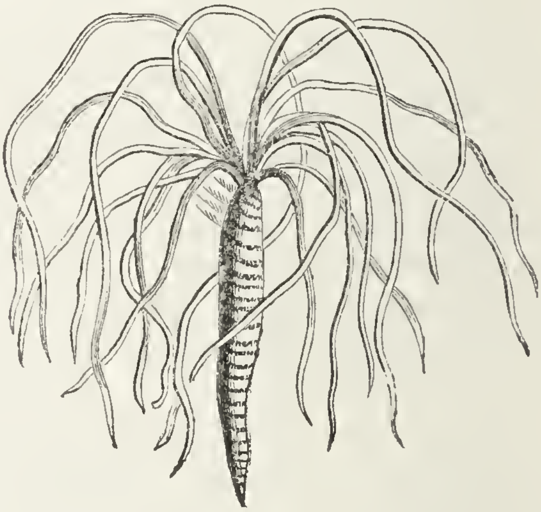
It is the single-pieced shell that the child places to its ear, supposing that it can then listen to the sounds of the sea; a fact to which Bernard Barton thus alludes:—

> "Hast thou heard of a shell on the margin of ocean
> Whose pearly recesses the echoes still keep,
> Of the music it caught when, with tremulous motion,
> It joined in the concert poured forth by the deep?
>
> And fables have told us when far inland carried
> To the waste sandy desert and dark ivyed cave,
> In its musical chambers some murmurs have tarried
> It learnt long before of the wind and the wave.
>
> Oh! thus should our spirits, which bear many a token
> They are not of earth, but are exiles while here,
> Preserve in their banishment, pure and unbroken,
> Some sweet treasured notes of their own native sphere.
>
> Though the dark clouds of sin may at times hover o'er us,
> And the discords of earth may their melody mar;
> Yet to spirits redeemed some faint notes of that chorus
> Which is born of the blest, will be brought from afar!"

Many shells are in two pieces, hence called *bivalve*; as familiar examples of which, the mussel, the cockle, and the oyster may be mentioned. Many persons are said to have become ill from eating mussels, which has been accounted for in various ways. It is probable, however, that these marine animals were not in a healthy condition—thus resembling oysters, which are sometimes said "to be sick." Mussels are always best when they are treated like those far-famed delicacies, in being taken from the sea, and deposited in river water, where they can be refreshed by the tide. The village of Hambleton, in the county of Lancaster, not far from the river Weir, is said, in this way, to have very choice mussels. Ophelia asks:—

> "How should I your true love know
> From another one?
> By his cockle-hat and staff,
> And by his sandal shoon."

The cockle to which she refers is the large scallop, found on many of our coasts. Here, too, after a stormy day, silver oysters, as the Kentish people call them, may be picked up. One called the waved anomia is about an inch and a-half wide; it is marked with fine irregular thread-like lines, crossing curved ones, and inside it has a beautiful pearly green colour. This,



THE TEREBELLA.

with other kinds, may often be found attached to the common oyster. Some of these creatures have only to open their two shells and suddenly close them, that the water they contain may be discharged, and the lime or the scallop is urged onwards or upwards. When the force of one rapid closure is exhausted, another and yet another is made; thus the creature takes long and rapid leaps, shoots hither and thither with a zigzag course, and obtains from these movements, as well as from its wing-like shell, the name of "a butterfly of the ocean."

The rocks lying near Shakspeare's Cliff, like many others, will be seen at low water, pierced with large holes. The openings which appear on the surface are often empty, or contain shells in which the occupants are dead; but if the hammer and chisel be well plied, and a fragment be broken from the rock, it is probable that many living ones will be found. The animal is called the pholas, from a word meaning "to hide;" its habit being to bore a hole in the rock, and there to live and die. How it can thus make a house in stone has long been a question; but, if we may venture to express an opinion on the subject, we think that the hard substance is rasped away by means of those ridges observable on the shell, which are still harder. According to Priestley, this creature "illuminates the mouth of the person who eats it, and it is remarked that, contrary to the nature of other fish, which give light when they tend to putrescence, this is more luminous the fresher it is; and, when dried, its light will revive on being moistened either with salt water or fresh; brandy, however, immediately extinguishes it." The shell is usually white and thin, and the two parts are open at both ends. The prickles are thicker and larger at one end than the other. The pholas is provided with a long tube; and if one be taken and placed in sea-water, it will be seen to lengthen marvellously, and its action will prove truly interesting.

A very remarkable marine animal is called the *serpula*. The under-sides of every ledge, of every boulder, and of almost every pebble are studded with these twisting, creeping tubes; fine specimens of which are about one-fourth of an inch in diameter, each one being, like the shell of the oyster, the work of the little in-dweller. Watch the first of these which you can observe in a vivarium. The tube perhaps is closed, but now first comes forth its curious vermillion stopper, which has formed a beautiful and perfect defence; and then the breathing organs, an exquisite structure, adorned, it may be, with the richest tints of yellow, violet, azure, or crimson. That inverted-cone-like body will be thrown off after a few weeks' service, only to be succeeded, however, by another, another, and another.

You wish, it may be, to examine the serpula more narrowly, and so, with a glass to your eye, you make an approach to the glass of the tank in which one has been placed. But, with the rapidity of a flash of lightning, he has withdrawn into his tube, as if conscious of danger; and only when he feels perfectly safe will he again be visible. Mr. Gosse has more minutely and happily described than any one else, the wondrous mechanism of these two actions; and of this a succinct account may now be given. Behind the head, or what may be so termed, the sides of the body are cut into nipple-like feet, about seven pairs in all; these are perforated, and carry so many bundles of fine, elastic, horny bristles, like the hairs of a camel's-hair pencil, each pencil carrying from twenty to thirty bristles. A few of these are simple hairs, but the majority are of elaborate workmanship; for each one consists of a transparent, yellow, horny shaft, the extremity of which expands into a slightly-enlarged knob. This knob is cleft into four points, three of which are minute, but the fourth is developed into a long, highly elastic, and finely pointed spear. And the pencils are acted on by appropriate muscles.

When the serpula would extrude its body from the tube, these organs push against the walls of the interior, which are lined, as you may see, with a delicate membrane. The opposite feet of one segment protrude the pencils of bristles, one on each side, the acute points of which penetrate and catch in the lining membrane; the segments behind this are now drawn up close and extend their bristles, these catch in like manner; then an elongating movement takes place; the pencils of the anterior segments being now retracted, they yield to the movement and are pushed forward, while the others are held firm by the resistance of their holding bristles; thus gradually the fore parts of the animal are exposed.

But this gradual process would not meet the need of a creature so sensitive to alarm when it wishes to retreat; a further provision is therefore necessary, and this Mr. Gosse has clearly and ably described. "If," he says, "we look at a serpula recently dead—which we may readily do, since it is the habit of most of these creatures to come out to die—we shall find, with a lens, a pale yellow line running along the upper surface of each part, transversely to the length of the body. This yellow line, which cannot be appreciated by the unassisted eye, is a muscular ribbon, on which stands up edge-wise a multitude of what I will call combs, or rather sub-triangular plates. The edge of each plate is cut very regularly into six teeth, which curve in one direction, and one other curved so as to face these. The combs stand side by side parallel to each other, along the whole length of the ribbon, and there are muscular fibres seen affixed to the smaller end of every plate, which doubtless give it independent motion. I counted 136 plates on one ribbon; there are two ribbons on each thoracic segment, and there are seven such segments; hence we may compute the number of comb-like plates to be about 1,900, each of which is wielded by muscles at the will of the animal; while, as each plate carries seven teeth, there are between 13,000 and 14,000 teeth hooked into the lining membrane of the cell, when the animal chooses to descend." No wonder that, provided with so complicated and perfect an apparatus, he retreats so rapidly.

Another creature, the *terebella,* forms a tube of bits of "beach," arranging them as regularly as rows of bricks, and strongly cementing them together. If one be placed in a vessel of water, and supplied with the requisite materials, it may be seen pursuing its task. Moving its head continually from side to side, it lengthens or shortens the thread-like rays that are placed there, and with a glutinous membrane for the base of its tube, piles on it piece after piece, which adhere immediately to it. In summer it will build a new house in about four hours; in winter an hour or two longer is required. The well-known ship-worm differs from the animals now described. If we wish for specimens of it they may be found in piers and wood-work about our harbours. Little tubes are there observable, sometimes one or two feet long, not always straight, but bending according to the grain of the wood; and within is the creature, occupying usually a shelly case. The true shell is at the end of this one, and consists of two valves; the body has the appearance of a long worm. These creatures hasten the ruin of structures in wood, placed in or near the sea, such as piles, dykes, and even vessels. Piles are generally untouched as far as they are discoverable at the lowest sea, but from a certain point, constantly under water, to a very considerable depth, the holes of these worms are so numerous that the thickest piles give way to the slightest efforts. So extensive were the ravages of the teredo in the dockyard at Plymouth, that, in the course of four or five years, it became necessary to remove the wood that it had bored. Great alarm was excited in the United Provinces about a hundred years ago, on finding that the piles which supported the banks of Zealand had become so injured as to threaten their destruction. In Holland, indeed, the results of this creature's operations have been most fatal. Vessels, too, have been known to spring leaks in consequence of the holes made in them by these worms.

The thickness, roughness, or smoothness of shells appears greatly to depend on the stillness or the agitation of the water they inhabit. Two specimens of the same kind are often very different in appearance, from their occupying two different situations. Thus, the common whelk of our coast is thick, solid, and heavy, when found in a rough sea; and thin, light, and smooth, when taken from the still water of harbours. Boring-shells are generally influenced as to size, thickness, and even form, by the hardness or softness of the rock in which they are found. The beautiful and varied colours of shells are produced by little vessels of colouring substance which exist only in the front part of the mantle. Their brilliancy depends greatly on the health of the animal, and on the food, light, and heat with which it is provided. The shells of tropical seas are often extremely bright and beautiful, surpassing those of temperate regions; while those that live in wood or stone have little or no colour.

Let us now pass to other creatures. What a beautiful object is the feather-star; great as are its varieties, adorned by hues of deep-rose, rich orange, a light straw colour, as well as white, or barred and variegated with rose! They suggest in their tints their only rivals—those of our flowers. And now look at this creature. Five arms are set around a kind of cup, which contains the body of the animal, with its mouth in the centre. What a combination is here! The arms are not of one piece each, but composed of an immense number of small pieces, held firmly together by an investing membrane, thus giving the structure all desirable flexibility. The upper or convex side of the cup is supplied with a number of hooked filaments, so that the sea-star can anchor itself securely to a mass of sea-weed or corallines, and then look out for its prey.

There is a distant relation of the sea-star: it is the sea-egg, urchin, or echinus, living in a dome-like shell. Now here is a question: as the animal grows, how is its stony mansion to be enlarged? Were the shell of one piece growth would be impossible; the Divine Architect has therefore built up its house of a multitude of five-sided pieces, all fitted together with astonishing accuracy. Covering the entire surface of the shell, and passing between the margins of all these pieces, is living membrane, which secretes and deposits calcareous matter, in an equal ratio, along the edge of each one of them. The dome, too, is arrayed with spines of greater or less diameter, each one being indented at its lower end, that it may fit exactly the little protuberance to which it is attached by a nicely-adjusted ligament, and prove, at the pleasure of the animal, a leg, on which it may roll itself to another spine, becoming a leg in its turn, thus removing the dwelling with its inhabitant from spot to spot. Still further: scattered over the skin are a multitude of little processes. Accurately examined, each one is a pair of calcareous forceps mounted on a stem, opening and shutting its blades so long as the animal lives, with considerable force. Their purpose has been long an enigma to naturalists. But they are regarded by some, with great probability, too, as the creature's police; arresting the troubler whatever it may be, and ejecting it from the body on which it has intruded. Nor have we yet exhausted the wonders of this structure. Capture one of these creatures, and you will have in it much to observe. If placed in a vessel of water, you will find it actually scales the sides, and hangs in safety from the perpendicular surface. If then we look attentively, we shall find rows of orifices into the interior, passing from pole to pole, running in pairs, each having five; and a tube, terminating in a powerful sucker, passing through each opening. Pushing these suckers beyond its longest spines, and bending in all directions, they enable the urchin to make his ascent, even up the most precipitous sides of the rock, and at his pleasure to anchor himself to it.

CHAPTER VII.

THE PRAWN, THE LOBSTER, THE CRAB, AND THE SHRIMP.

> " 'Twas wisdom, mercy, goodness, that ordained
> Life in such infinite profusion.—Death
> So sure, so prompt, so multiform."
>
> MONTGOMERY.

THE SHRIMP — THE PRAWN — THE CHANGE OF ITS SKIN — THE LOBSTER — THE COMMON SHORE CRAB — THE PEA CRAB — THE VELVET CRAB—THE HERMIT OR SOLDIER CRAB.

"WALKING," says Paley, "by the sea-side in a calm eve, upon a sandy shore, and with an ebbing tide, I have frequently remarked the appearance of a dark cloud, or rather very thick mist, hanging over the edge of the water, to the height perhaps of half a yard, and of the breadth of two or three yards, stretching along the coast as far as the eye can reach, and always retiring with the water. When this cloud came to be examined, it proved to be nothing else than so much space filled with young shrimps in the act of bounding into the air from the shallow margin of the water, or from the wet sand. If any motion of a mute animal could express delight it was this: if they had meant to make signs of their happiness, they could not have done it more intelligibly. Suppose, then, what I have no doubt of, each individual of this number to be in a state of positive enjoyment;—what a sum, collectively, of gratification and pleasure have we here before our view!"

The outer covering of the shrimp consists of a thin shell of a green and transparent colour, spotted with grey. It is divided between the head and tail into six parts, each of which works into the other like the portions of a coat of mail, thus combining hardness with flexibility, while the body is defended without impeding its motions. The tail, consisting of a wing-like apparatus of four parts, which can be folded compactly or extended at pleasure, is admirably adapted to propel the shrimp. The head is provided with a pair of feelers as long as the body, and the two fore-legs are made to act as a hand, being provided with a jointed forceps for the seizure of food. Three pairs of legs are placed on the fore part of the body; and, behind, are five other pairs of legs, which are much shorter, diminish successively in size, and are fringed with bristles. The fore part of the head has on each side a fan-like wing, feathered on each side, transparent, and so flexible as greatly to aid the motions of the animal.

Shrimps, as may often be observed, are taken for food with a net; it is used either by a man, woman, or child wading up to the knees, or by fishermen who go out in boats. The boat fishermen often boil them on board. They are not allowed to boil longer, nor generally so long as ten minutes, as they become hard if allowed to remain a longer time, and the fineness of the flavour is also greatly diminished. Their colour is changed by boiling to that which they wear when piled on the dishes of the fishmonger's stall.

The common prawn is an interesting and beautiful creature. The first pair of feet are slender and most delicate in their structure, and provided with a brush-like appendage of short hairs. Wonderful is their power of motion, and still more so the purposes for which they are used. They are plied around the eyes, as we have often observed, and about the jaws, horns, and feelers, and the other beautifully constructed and arranged parts of the body, to clean them thoroughly; the body being supported and raised high on the four pair of legs, and the lower part of the tail being curved forward between them, expressly for this purpose. The appearance of the prawn in full swimming action is very elegant. The body is transparent, and the front feet are generally laid backward and tucked under the body, like the fore-legs of a stag in the act of leaping; the long antennæ float gracefully on each side of the body, while its strong paddles urge it rapidly through the water. It has also prominent and stalked eyes.

The prawn not only forages for food by swimming about in the waters, but it thrusts its second pair of feet very cautiously into every cranny in its way, into the tubes of the marine worms, or the single shells of molluscs, and were it not for the lids with which they are provided, the little in-dwellers would soon be a prey. Only let anything edible be met with, and these hand-like feet seize it and transfer it to the jaws. The antennæ, or horns, appear to be organs of smell as well as touch. Thus, when a particle of food has been dropped into a vessel containing some of these creatures, and has sunk to the bottom, the moment the antennæ of a prawn have passed across the column of water through which the food has fallen, the creature changes its motion, and darts rapidly here and there, from the surface throughout the path of its transit, till it is discovered. Often after its being actually devoured, another prawn will gain the scent, which seems to remain, and engage most zealously in searching for a prey. A prawn has even tracked the same food to an anemone, and dragged it not merely from the pouch, but from the stomach of the animal, which can only be secure by bringing all its tentacles together, forming itself into a small globe, and closing all approach to the entrance of its body.

Like its fellows, the shrimp, the crab, and the lobster, the prawn changes its skin. When the time comes for this process, it ceases to feed, and moves about very restless, till it has fixed on some spot it prefers. The third, fourth, and fifth pairs of legs are then stretched out wide apart, and the feet hooked so as to hold firmly upon the surrounding substances, in such a way that the body may be poised and capable of moving freely in all directions. The prawn then slowly sways itself to and fro, and from side to side, with strong muscular efforts, apparently for the purpose of loosening the whole surface of the body from the body-shell. The two pairs of seizing-legs are at the same time kept raised from the ground, stretched forwards, and frequently rubbed over each other; the eyes also move within their covering by contraction from side to side; and when every precaution appears to have been taken, a fissure takes place between the body-shell and the abdomen at the upper and back part, and the head, antennæ, legs, and feet, with all their delicate appendages, are slowly and carefully drawn backward and out from the shield, until even the eyes are quite clear of the body-shell, and appear above the margin of it; the prawn, thus half released, then makes a sudden backward spring or jerk, and the whole covering is left behind, generally adhering by the shell of the six feet to the surface it had selected for its purpose.

Mr. R. Warrington, to whom we are indebted for the materials of this description, well remarks:—" A moment's consideration will develope to the contemplative mind what a truly wondrous process this act of exuviation really is. When we reflect on the small size of this crustacean, and the extreme delicacy and intricacy of its various organs, and then find that in this moulting the skin of the most minute and complicated of these structures is thrown off in a complete and unruptured state, even to the gauze-like membrane covering the projecting and pedicled eye, the filamentous antennæ, the many-jointed legs, the delicate hand, the paddled abdomen, with its beautiful appendages, the palpi, and all the minute spines and microscopic hairs with which all these various members are provided,—the human mind can hardly appreciate the wonderful wisdom of the creative power that could have called into existence so marvellous an adaptation."

A few facts may yet be added. No sooner has the prawn been liberated from its old covering, than it rolls on the surface of the ground perfectly helpless, for so soft is it that it has not the power of supporting its own weight erect upon its feet, while the delicate antennæ float on the water like gossamer threads. Soon, however, it plunges or springs, by a strong muscular exertion of the abdomen, from place to place, stretches its webbed tail and the large paddles of its swimming apparatus, and speedily retreats into some dark or sheltered corner, where it remains, continually exercising its various organs, until its new covering is sufficiently hard to allow of its venturing forth among its companions, which, as yet, it has been obliged to avoid by a series of forcible leaps. In due time, it comes forth from its hiding place with greatly increased beauty; its colours, particularly the orange and rich brown bands which encircle the pale blue feet, are remarkably bright and clean; the markings are nicely defined, and the small spines and fringes of hair are admirably developed and clear. The creature seems, indeed, proud of its new vesture; and may well call forth expressions of delight.

The lobster is found in the greatest abundance on the rocky coasts of this kingdom, in clear water of no very great depth, at the time of depositing its eggs, about the middle of summer. It changes its skin in very much the same way as the prawn. Mr. Peach gives the following pleasing scene from lobster life:—"I have heard the fishermen of Goran Haven say that they have seen in the summer, frequently, the old lobsters with their young ones around them; some of the young have been noticed as six inches long. One man noticed the old lobster with her head peeping from under a rock, the young ones playing around her: she appeared to rattle her claws on the approach of the fisherman, and herself and young took shelter under the rock; this rattling, no doubt, was to give the alarm. I have heard this from several, some very old men, who all speak to this without concert, and as a matter of course; and they are men I can readily believe." There is often in the season a supply at Billingsgate of not less than from 20,000 to 50,000 in one day.

The common shore-crab may frequently be met with. The French, who are as familiar with it as we are, call it very properly *le crabe enragé,* for only attempt to touch it, and it will run along the sand, greatly excited. Seize it before it can succeed in burying itself, its claws become defiant, it will try with all its might to seize and pinch the fingers in which it is held, and if it has no other resource, will leave you grasping a claw or claws, and make off as if it suffered no pain. Any or all the legs may be thrown off on the suffering of injury, but not with equal facility in all the species; for in some, as in the common crab, if they be crushed or broken without great violence, they are sometimes retained, and the crab will in no long time bleed to death. To save the crab the fishermen proceed to twist off the limb at the proper joint, or give it a smart blow, when it is rejected; and in either case the bleeding is stopped.

The pea-crab is another curious creature, very commonly found in the common mussel on many parts of our coast, and especially in those which are taken from rather deep water. "On one occasion," says Mr. Bell, "I dredged great numbers of these mollusca on the coast of Dorset, and found by far the greater number of them with one or two of these little soft-bodied crabs within their shells; for the females are much more common than the males. The latter sex I have occasionally taken apart from the mussel-shells, the former never. They also occasionally inhabit the common cockle, in which I have now and then found them, as well as very rarely in the oyster." The velvet crabs of our coasts, so called from the velvety substance with which the shells are covered, and which extends even to the limbs of the animal, are among the most beautiful in appearance. They are of a reddish colour, tinged with blue. One of them, very commonly found, has colours remarkably bright; it is about two inches and a-half long, and much esteemed for food.

One crab shuts itself up, and lives away from its kind, a sort of hermit life. Its usual name is the hermit, or the soldier-crab; and for the course it takes there is an absolute necessity. If one be met with, it may be readily observed that the hinder part of the animal is destitute of the shelly covering which most creatures of its kind have; and hence, when very young, it takes possession of some empty spiral shell, or any other adapted to its purpose, which it finds on the beach. Within this it duly coils itself; putting forth its claws, it moves along like the snail, with its house on its back; and as soon as this is too small, looks out diligently for another.

CHAPTER VIII.

FISHES AND BIRDS.

Shoals
Of fish that with their fins, and shining scales,
Glide under the green wave.

Milton.

By night and day,
Unvex'd with storms, the peaceful billows play;
The firmament above is bright and clear;
The sea-fowl, birds of water, air, and land,
Joyous alike upon the wing appear,
Or when they ride the waves or walk the sand:
Beauty, and light, and joy are everywhere.

Southey.

EGGS OF FISHES—THE HERRING—THE MACKEREL—THE GULLS—GREBES—THE GUILLEMOT—THE PUFFIN—THE CORMORANT—LARGE MASSES OF ROCK ONCE LIVED.

That singular-looking object is called the "Mermaid's-purse," or the "Fairy-purse;" and fanciful indeed is its appellation. It is, in fact, the egg-case of some of the several kinds of ray-fish or skate. It is open at both ends to admit the sea-water, and in September or October, if one be opened, a substance will be seen resembling the yolk and white of a bird's egg. If these purses be watched the fish may be seen partially developed, and then fully so, lying with its tail turned over its back, and looking exactly like its parent. If one be taken from the shore, and placed in a basin of water, the little creature will, in due time, come forth, and swim about complacently in its little ocean. The egg-cases of other fish are equally curious.

The herring appears permanently to inhabit our seas. The fishing is only carried on during the spawning season, when the fish are in the highest perfection. The season varies at different parts of the coast; at Cromarty large shoals appear as early as May, while at Yarmouth the fishing commences about the middle of September. The spawning season being over by the end of October or the beginning of November, the fishing terminates, as the herrings are then in a poor and exhausted condition. The Yarmouth boats continue at sea until they have caught eight or ten lasts, of 13,000 herrings to a last, or are compelled to come on shore for provisions. They are generally absent from three to six days. The white or pickled herrings merely require to be salted and put into barrels, which is done while the vessel is at sea; but when it is intended to prepare red herrings, a different process is adopted. They are sprinkled with salt, in quantities which depend on the state of the weather, or the distance from port. On being landed, they are immediately carried or carted away in baskets to the "rousing-house," adjoining the house where it is intended that they should be hung and smoked. They are then again sprinkled with salt, and are heaped together with wooden shovels on a floor covered with bricks or flag-stones, where they remain five or six days; they are afterwards washed, spitted on round rods made of fir, and then hung up before fires of wood. The operation of smoking red herrings occupies at least three weeks for those intended for home consumption, as they are preferred when soft and not too highly dried; but those for exportation undergo the process for four weeks or thirty days. The fires are then extinguished, and after the house has been allowed to cool, the spits are taken down, and in a few days afterwards the herrings are put into barrels made of fir, and sometimes of oak or other hard wood. The large, full-grown, and well-shaped herrings form the first quality, and are known, far and wide, under the name of "bloaters."

The mackerel, perhaps the most beautiful of British fishes, approaches the coast in large shoals, and it was formerly supposed that its annual movements were from northern to southern latitudes, and from southern to northern. But this fish is to be met with in our own seas at all times in the year, though they are not found in great numbers during winter. The mackerel may be considered as frequenting nearly every part of the coasts of the United Kingdom, but it is most abundant on those of Sussex, Kent, Hampshire, and the western counties, and on those of Suffolk and Norfolk. May and June are the busiest months for mackerel fishing. A light gale, which gently ripples the surface of the water, and is called a mackerel gale, is the most favourable for it. The nets are shot in the evening, and sometimes hauled once during the night; at others they are allowed to remain in the water all night. The fish roving in the dark through the water hang in the meshes of the net, which are large enough to admit them beyond the gill-covers and pectoral fins, but not large enough to allow the thickest part of the body to pass through. In the morning preparations are early made for hauling in the nets. A capstan on the deck is manned, about which two turns of the drift-rope are taken. One man stands forward to untie the upper edge of each net from the drift-rope, which is called "casting off the lashings;" others hand in the net with the fish caught, to which one side of the vessel is appropriated; the other side is occupied by the drift-rope, which is wound in by the men at the capstan. The seasons fluctuate considerably, and the fish vary in quantity in different parts. On some nights 2,000 or 3,000 fish will be caught by one boat, and another not more than a mile distant will not take a hundred.

Listen to those sea-gulls. What a screaming hoarse voice is theirs! Well does it suit their marine life, in which the song of the lark or the nightingale would be of little use. Such is the vocal power of other birds; and we only know of one, the shore pipit, who, as it flies in the clear blue sky, or nestles in some crevice of the rock, can be said to sing.

The common gull, by the way, is well-known on most parts of our coast. It is of a beautiful pearly grey colour, and its head of a blackish brown hue. It cannot dive, but skims the water lightly, feeding on the creatures that come to the surface. The movements of these birds often add animation to the scene, while frequently they cover the crags of the rocks in countless numbers.

How graceful are the sea-swallows, greatly resembling those of the land. The grebes, of white breasts and silvery plumage, are almost constantly in the water, swimming against the wind, but ready to dive, or to take wing, whenever they are so disposed. The guillemot, with its short pinions, finds them able to bear it to projecting ledges of rocks and cliffs, from whence it can jump from point to point till it gains its rest in some far-up eminence. It is said that when the young bird gets to a certain size it climbs on the back of the old one that it may be conveyed to the ocean, while, were it to attempt to visit the sea alone, it would be in danger of death from the projecting points of the intervening sharp and rugged rocks. A strange proof of sagacity for a bird called "the foolish guillemot," or "foolish Willie;" why, it is very difficult to tell.

Among these sea-birds, too, a good order is maintained, not only admirable, but worthy of imitation by superior beings. "It will be found," says Mr. Yarrell, "that the guillemots occupy one station, or line of ledges on the rocks; the razor-bills another; the puffins a third; kittiwake-gulls a fourth; while the inaccessible pinnacles seem to be left for the use of the lesser black-backed and herring gulls. Two distinct species scarcely ever breed close by the side of each other." The razor-bill duck strongly resembles our well-known land bird. The puffin, a strange-looking bird, when once seen may be remembered for ever. Great numbers of the black cormorant rear their young among the cliffs of the Isle of Wight, and large flocks may often be seen on isolated rocks about our coast, as well as our sand-downs of the south. It has an instinct worthy of recollection; for as it feeds on large as well as small fish, it always seizes its prey by the head, so that it cannot be troubled by its fins or its scales. Flocks of the Solan goose visit various parts of our coast in spring and autumn. Some have been known for fifty years to return to the same spots.

What gave that little bird the name of petrel? From the Apostle Peter having walked on the water, and superstition having likened to this act some of its movements. A common name for its race is "Mother Carey's chickens," from their following in the wake of a ship to pick up what has been thrown from it, or the shrimp or crab that has come to the surface of the water. They have great strength of wing, and like those seas best which are most troubled, because their food is specially abundant. Hence, so much has been said of their foretelling a storm; but mariners are as yet very superstitious, and these birds are peculiarly fitted to run along the furrows of the ocean, however agitated, as larks do among those of the corn-field. Sometimes, but not rarely, the petrels come in flocks to our shores.

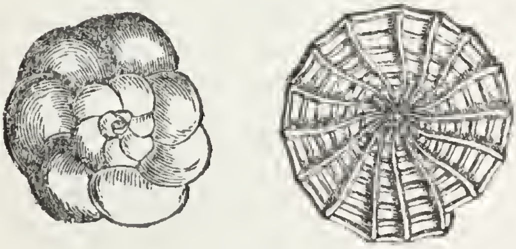
On the shores may frequently be seen some of the plovers running along a flat coast, feeding by the water, or picking up their food from the sand. Here, too, is the turnstone, so called from the knack it has of turning over the pebbles, that it may seize the insects and worms beneath. On these the sanderlings feed, gay little birds as they are, driving their bills obliquely, for this express purpose, into the sand. The merry little sandpiper, with its incessant motion and its loud piping note when rising into the air, is well fitted to be their companion.

"Along the salt sea's oozy verge,
When wafted high the ebbing surge
Unsheltered leaves the shelly fry,
Hark! the curlew's tumultuous cry:
They delve with slender bill and bow'd
The yielding sand; or shouting loud,
To warn their comrades of the way,
Lest darkling from the line they stray."

The long-billed birds come about the middle of autumn to every part of our coasts; wheeling round several times before they alight, and when they do, perforating at pleasure the low oozy shore.

The taking of the eggs of sea-birds is often attended with great peril. On one occasion, a father and two sons were out together, and having firmly fastened their rope at the summit of a precipice, descended, on their usual occupation. Having collected as many birds and eggs as they could carry, they were all three ascending by the rope, —the eldest of the sons first, his brother a fathom or two below him, and the father following last. They had made considerable progress, when the elder son, looking upwards, perceived the strands of the rope grinding against a sharp edge of rock, and gradually giving way. He immediately reported the alarming fact. "Will it hold together till we can gain the summit?" asked the father. "It will not hold another minute," was the reply; "our triple weight is loosening it rapidly." "Will it hold one?" said the father. "It is as much as it can do," replied the son; "even that is but doubtful." "There is then a chance of one of us being saved: draw your knife, and cut away below," was the order of the parent of these young men;—"exert yourself,—you may yet escape, and live to comfort your mother." It was an awful moment: the son looked up once more; but the sharp edge of the rock was still cutting into the rope, and it was now nearly severed. He drew his knife—he cut the rope—and his father and brother were instantly launched into eternity.

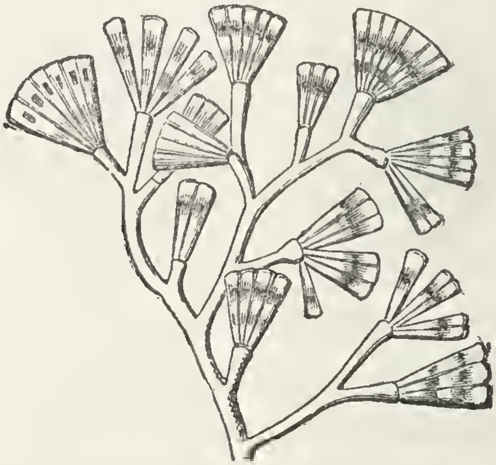
Turning now from the creatures that exist in the waters and on the rocks that skirt our shores, it must be with the remark that immense masses of these stupendous structures *once lived.* Of this, indeed, there is the most ample evidence. A large number of minute objects, called *foraminifers,* consist of one isolated cell or chamber, and have been placed in two classes. One is known by a long external neck or tube, in a small orifice, projecting from the upper part of the cell, somewhat like a Florence flask; while in the other, there is a very similar tube, only occupying a reversed position. Instead of projecting externally, it descends into the internal cavity, still taking its rise from the upper position of the cell, towards the lower part of which the opening of the tube appears, when it attains its full length. Little knowledge is, at present, possessed of the soft animal which was once the occupant of the cell. The whole cavity appears to have been one digestive organ.



MICROSCOPIC SHELLS.

Shells of these creatures may be found on the sandy beach and in the crevices of rock-pools, while some living specimens may be gathered from sea-weed; but they belong not merely to the present, but the past; for they are observable in geological deposits of various ages.

There is another object known to naturalists as the fan-bearer. The microscope reveals its fan-like leaves, sustained by slender glass-like threads; the leaves are of a yellow hue, diversely coloured, and marked with spots of a deeper tint. Each of the pieces or joints consists of a single cell, of a very delicate membrane. These plants—how, it is not known—have the power of extracting silex or flint-earth from the sea, and in fixing it in their tissues; and, as their bodies are indestructible, their remains accumulate under the sea. Their number, therefore, laughs at our highest attainments in arithmetic. Microscopic in themselves, they absolutely form beds of marl, chains of



THE FAN-BEARER.

hills, and rocky strata in every part of the globe. The world is indeed one vast mausoleum of the remains of these minute beings.*

Still more frequently may be found the cast of that coiled-up fossil, the ammonite. Its name was derived from its resemblance in form to the horn of Jupiter Ammon, and superstition tells

> "How of a thousand snakes, each one
> Was changed into a coil of stone,
> When holy Hilda prayed."

It has also been called the snake-stone. If in some parts of the coast, where these are found, you should ask, "Where is the head of the animal?" it may be that a specimen will be brought you on which will appear a serpent-like head, with two red eyes, expressly manufactured to meet such desires. Let it then be remembered that there was merely a shell, which became filled with soft mud, and that this was subsequently changed into stone. Here, too, may be found the nautilus, the sea-urchin, shells too numerous to be counted, sponges and corals in wonderful variety, and bones of birds, fishes, and reptiles.

The fossils offered for sale in masses of a hard substance are merely artificial combinations. The fact is, that there is a deposit of stiff blue clay, denominated galt, and called also Folkestone marl, and blue-chalk marl—this being found, as in East Weir bay, in a soft state, and into it other objects are pressed, all speedily becoming hard. Instances of a more ingenious fraud have often occurred. Mantell mentions a specimen of a tree sent to him as an entire trunk from the Isle of Portland, but actually made up of disconnected portions of stems and branches, belonging to several trees, very cleverly fitted and cemented together.

---

* Harvey's Sea-side Book.

Amidst all the enjoyments of the sea-side, why should they not be increased and purified by some act of mercy? The relief of distress—and it may be met with everywhere—will send a thrill of delight through the heart, utterly unknown to all who merely love their own selves. Grateful indeed are the recollections of those who can recal such acts as associated with every visit!

CHAPTER IX.

THE VIVARIUM.

The minutest throb
  That through their frame diffuses
The slightest, faintest motion,
  Is fixed and indispensable
As the majestic laws
  That rule yon rolling orbs.

SHELLEY.

HOW TO CONSTRUCT A VIVARIUM—THE PLANTS AND CREATURES TO BE PUT IN IT—DIRECTIONS FOR ITS CARE.

It is natural to wish to have, and to offer to others, some memorial of a pleasant sea-side visit. Stones set in rings, sea-weeds, and shells, have often been employed in this service. To take away living creatures in sea-water is only a recent device, but one that promises to blend with gratification many advantages.

A simple earthen jar, easily procured, may be the provisional depot, to be in due time defended by an oil-skin, or a cover which may be screwed on after the living specimens have been placed in sea-water, of which it is to be about two-thirds full. Then let an effort to stock it be made by going down at low spring-tide to a ledge of rocks, and with a hammer and chisel breaking off some stones on which some sea-weeds are growing. Two kinds, alike desirable, may be obtained throughout the year: *ulva latissima,* the sea lettuce, and *enteromorpha.* Anemones of various kinds may be brought home from the sea-side, nicely wrapped in sea-weed, if no vessel is within reach. These are especially desirable, and of them a variety may be easily procured. To these madrepores, corals and serpulæ, may be added; and if then a coralline, a prawn, a little hermit crab, and a few small fish are procured, there will be a sufficiency for the first experiment. Carefully fastening down the treasures you have gained, they will travel safely.

Now you have reached home, you may set up your *vivarium*. A bell-glass, such as gardeners use, with its knob fixed into a stand of wood or earthenware, will answer the purpose. So far from seeking one that is cylindrical, for this will be too fragile, look out for one that tapers towards the apex—a much stronger form; and then, as its diameter should not exceed sixteen inches, for otherwise it will be in danger of breaking, a few shillings will defray the cost.

Do you wish for something more showy? Tank-makers—easily accessible—will show you some with all the latest improvements. Let us suppose, then, the vessel to be placed on a table. The base should be covered with sea-sand and small pieces of gravel, a miniature resemblance of a shingly beach. Boulders and pieces of stone, kept for some time in salt-water, may now be reared into artificial rocks; and on these should be placed the growing sea-weeds. Recesses and caverns, too, should intersect your fabric, not only for the sake of the picturesque, but also for some of the living creatures who will like to hide in them. The anemones will find an eligible locale on any jutting where they can be best seen; so will the serpulæ; the other contents of your jar will provide for themselves as soon as you have poured in the sea-water.

"Alas!" do you say: "The vessel was broken during the journey, and the creatures are lost!" Artificial salts may easily be obtained, according to Mr. Warington's formula: Sulphate of magnesia, 7½ oz.; sulphate of lime, 2¾ oz.; chloride of sodium, 43¼ oz.; and chloride of magnesia, 21 grains. These quantities will make 10 gallons of artificial sea-water. Sea-water, however, contains innumerable germs of life which artificial water cannot; and, of course, this is a disadvantage. A little glass bubble, easily procurable, is desirable to show, by its floating, the specific gravity of the water. That of sea-water averages about 1·025, and when from evaporation the water you have exceeds this, a little rain or distilled water may be added to restore its original density. Living sea-weed and animals may also be readily procured.[*]

To prevent a green vegetation obscuring the glass of the vessel or tank, the common periwinkle may be employed, for it has a ribbon-like tongue, provided with flinty teeth, which it will use as a scythe cutting down grass, to clear away this undesired growth; but on the failure of this creature, a piece of rag tied round one end of a stick will prove to be effectual. Should any creature die, it must be immediately withdrawn, or there will be a most offensive odour. Too much light should be avoided by blue stained glass, or by coloured blinds of the same colour, or one slightly tending to green. The heat of the vivarium should resemble that of the sea, and range from 45° to 75°. Small particles of raw meat, dried in the sun, and moistened when used, or mussel, cockle, or raw fish pulled into small pieces, will be found appropriate for food. No more should be given to any creature than it can receive at once; any remains should be transferred to another, or removed from the tank.

---

[*] Mr. Lloyd, of Portland Road, and Mr. Bohn, of Essex Street, Strand, have them in great variety.

Go! now to your vivarium; look! and you will see numbers of minute drops forming on every plant, and even where the tiny vegetation is beginning to grow on the stones, and then rising rapidly to every part of the surface, so long as the rays of light are uninterrupted. Of what, then, do these globules consist? Of pure oxygen, which the light enables the plants to give forth, while they feed on the carbonic acid gas given out by the animals; and thus the two respirations counterbalance each other. As too, you watch from day to day, many things described in this volume will be clearly beheld, to your satisfaction and delight.

INDEX.

PAGE
Agates 74
Alum Bay 86
,, Sand 87
Amber 72
Anemones, Sea... ... 117, 118
Animalcules 132
Ascidians, The 139
Beach, Sea, Motion of, ... 68
Beroe, The 139
Boulders 67
Brighton 10, 99

Cabbage, Sea, the 62
Chalk, The 84
Chesil Bank, The 69
Coproliths 72
Coral, Red, The 128
Corallines... 110-116
Cornelian Bay 74
Cornelians 75
Clouds, The 36-38
Coral Grove, The 123
,, Island, The 125
,, Makers 126
,, Reef, The ... 126-129
,, Rock, The 124
Crab, The... 161

Devil's Dyke, The 10
Devon, Coast of 13
,, North and South 14, 15, 92-96
Dorset, Coast of 12
Dover 7, 99

PAGE
Downs, The 4
Downs, The Sussex 8

England and France once united 85

Fan-bearer, The 172
Flamborough, Caves at ... 89
Folkestone 7
Foraminifers 171

Goodwin Sands 6

Hants, Coast of 11
Hastings 8, 9
Herne Bay 97
Herring, The 164
Hob Hole 89

Jasper, The 73
Jelly fish, The 134-138
Jet 74

Kent, Coast of 4

Lobster, The 160

Mackerel, The 166
Margate 5
Microscope, Value of ... 18
Mollusca, The 140

Needles, The 91

Ocean, The 19

Page
Ocean, Colour of 31
,, Evaporation of ... 29
,, Immensity of... ... 22
,, Phosphorescence of 137
,, Saltness of 27
,, Temperature of ... 30
,, Tides of... 24

Pebble, Story of a 77
Pholas, The 145
Plants, Marine ... 56-66
Portland, Isle of 97
,, Quarries of ... 98
Prawn, The 156
Pyrites 72

Ramsgate 5
Rocks 80
,, Cuttings in 82
,, Stratified and unstratified 80

Samphire, The... 65
Hastings Sand 50
Sands, Margate 47
,, Ramsgate 48
,, Scarborough... ... 52
,, Slapton... 50
,, Ulverston 51
Sand Ripples 53
Sandstone, Impressions on 54
Scarborough 16

Page
Sea-bathing 49
Sea-beach, The 46
,, Birds 167-170
,, Encroachments of the 87
,, Star 151
,, Urchin 152
Serpula, The 137, 146
Shells, structure and colours of 142
Sheppey, Isle of 4
Shrimp, The 155
Sponge, The 133
Squirt, Sea, The 139
Storm, The 38-41
Storms, Law of... 42
Storm Painter, The ... 42

Terebella, The... ... 144, 149

Under-cliff, The 81

Virgularia Mirabilis .. 113
Vivarium, The... 175

Waves, Cause of 32
,, Velocity of 33
Weeds, Sea 102
,, Structure and uses of 110
Wight, Isle of 12

Yorkshire, Coast of... ... 15

ENGRAVINGS.

Ascidians, Compound ... 137
Fan-bearer, The 172
Hornwrack, Great, Cells of 111
Jelly-fish, The 136
Microscopic Shells 171
Polyp of a Coralline ... 120
Red Coral, The 128
Sea Anemone, The 121
Serpula, The 137
Sickle-beard, The 112
Terebella, The... 144
Virgularia Mirabilis, The 113

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